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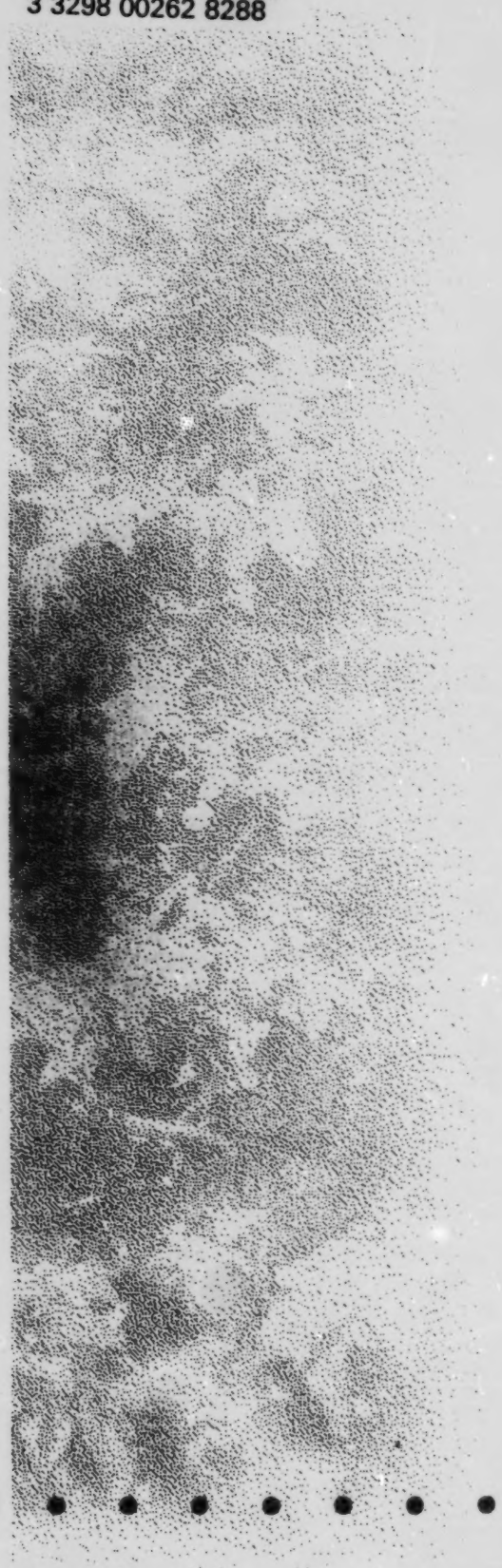
WARS 2000

Wildlife Accident Reporting System

2000 Annual Report

(1991 to 2000 Synopsis)



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EXECUTIVE SUMMARY

The British Columbia Ministry of Transportation (MoT) administers the Wildlife Accident Reporting System (WARS). The WARS system is designed to analyze wildlife accident data collected by MoT Maintenance Contractors on numbered highways in British Columbia.

Since 1978, over 70,000 wildlife accidents have been reported on provincial highways. More than 90% of the accidents involved deer, moose and elk. Between 1995 and 2000, 13 people were reported killed in wildlife-related motor vehicle accidents in British Columbia. After weather, the Insurance Corporation of British Columbia (ICBC) rates wildlife as the next highest environmental contributing factor for police-attended accidents. Between 1997 and 2000, ICBC spent over $67 million on wildlife-related motor vehicle accident claims.

In 2000, over 4,700 wildlife-related accidents were reported in British Columbia (table below). Between 1999 and 2000, the number of wildlife-related accidents reported fell by 2.4%.

Wildlife Accidents by MoT Region (Year 2000)

	Region 1	Region 2	Region 3	Region 4	Region 5	Region 6	Total
Wildlife Accidents	258	920	1,461	918	204	1,001	4,762

In 2000, it is estimated wildlife accidents cost the Province over $18 million in motor vehicle accident claims; $600,000 in highway accident clean-up costs; $300,000 in lost provincial hunting license revenues; and $30 million in lost value to residents and non-residents who view or hunt wildlife.

MoT is committed to protect the safety of the motoring public; stem the rising societal cost of human fatalities and injuries, motor vehicle damage, and highway maintenance; and reduce the loss of wildlife on provincial highways. Consequently, MoT uses the WARS system to:

1. identify wildlife accident-prone locations and wildlife accident trends;
2. direct wildlife accident mitigation efforts;
3. evaluate the effectiveness of wildlife accident mitigation techniques;
4. provide wildlife data for highway planning purposes;
5. model and forecast wildlife accidents; and
6. establish policies and strategies for wildlife accident issues.

The WARS system is becoming an increasingly valuable information resource for MoT, and other government agencies, consultants, researchers, wildlife associations, special interest groups and members of the general public. The Ministry of Water, Land and Air Protection uses WARS data to assess provincial wildlife population trends. ICBC uses WARS data for identifying highway locations where joint MoT/ICBC initiatives, such as exclusion fencing, warning reflectors, and camera detection systems, can be targeted to reduce wildlife-related motor vehicle collisions.

	WARS Wildlife Accident Reporting System **2000 Annual Report (1991 — 2000 Synopsis)**
Author:	Leonard E. Sielecki, M.Sc., MCIP, R.P.Bio
Date Published:	October 2001
Prepared for:	Environmental Management Section Engineering Branch B.C. Ministry of Transportation Victoria, B.C. Canada
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Abstract:	The Wildlife Accident Reporting System (WARS) is designed to collect and store information on wildlife killed on highways in British Columbia. Wildlife accident information is used by the Ministry to detect accident trends. The data is used for identifying highway locations that require wildlife mitigation and in establishing policies and strategies for the entire province.
Comments:	In 2000, Ministry Maintenance Contractors reported finding 4,768 dead wild animals on British Columbia highways. Approximately 80% of the animals reported killed were deer. The number of wildlife accidents reported to the Ministry decreased by 2.4% from 1999.
Keywords:	WARS, Wildlife Accident Reporting System, wildlife, wildlife kills, wildlife accidents, accident statistics, wildlife reflectors, wildlife fencing, British Columbia, cost

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WARS Wildlife Accident Reporting System

2000 Annual Report

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Wildlife Accident Reporting System (WARS) form H-107 (2001/06)

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Ministry Maintenance Contract Areas

APPENDIX C

Wildlife Warning Reflector Installations (April 2001)

INTRODUCTION

Overview

The Environmental Management Section, Engineering Branch, British Columbia Ministry of Transportation (MoT), administers the Wildlife Accident Reporting System (WARS), a system designed to collect and analyze information on wildlife killed and retrieved on numbered highways in British Columbia (Map 1).

Wildlife accident information is used by the Ministry to compile statistics for detecting and evaluating accident trends. This data is particularly valuable for identifying highway sections that require wildlife mitigation and in establishing practical policies and strategies for the entire province. WARS is also used as an evaluation tool for the effectiveness of various mitigation methods. The Ministry's Regional Environmental Coordinators have direct access to the WARS system and provide wildlife-related motor vehicle accident information to Ministry Regional and District offices (Maps 2 and 3).

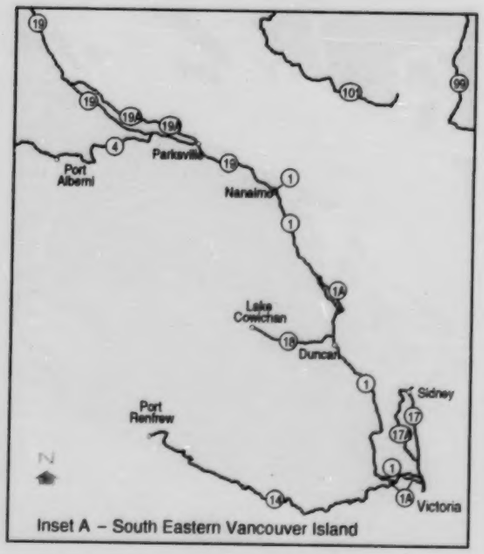
The Ministry of Water, Land and Air Protection (MWLAP) also uses the data to assess wildlife population trends in its management units. Data from the WARS system is used by the Insurance Corporation of British Columbia (ICBC) for identifying roads where mitigation measures can be targeted in joint Ministry/ICBC initiatives to reduce wildlife-related motor vehicle accidents.

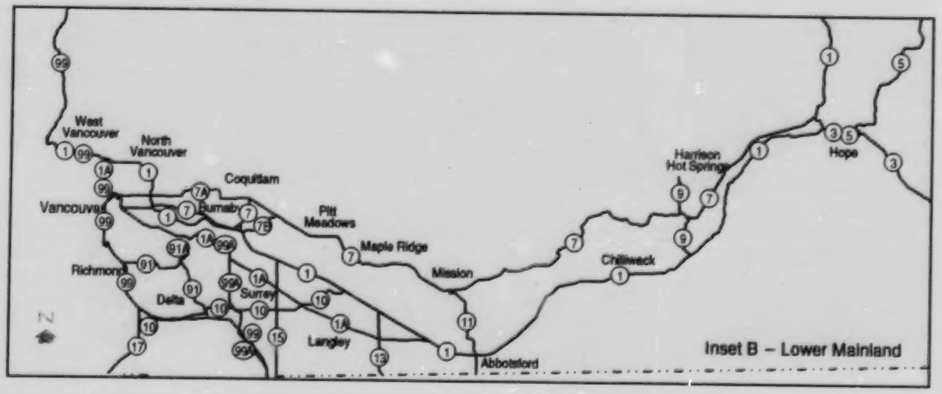
Methodology

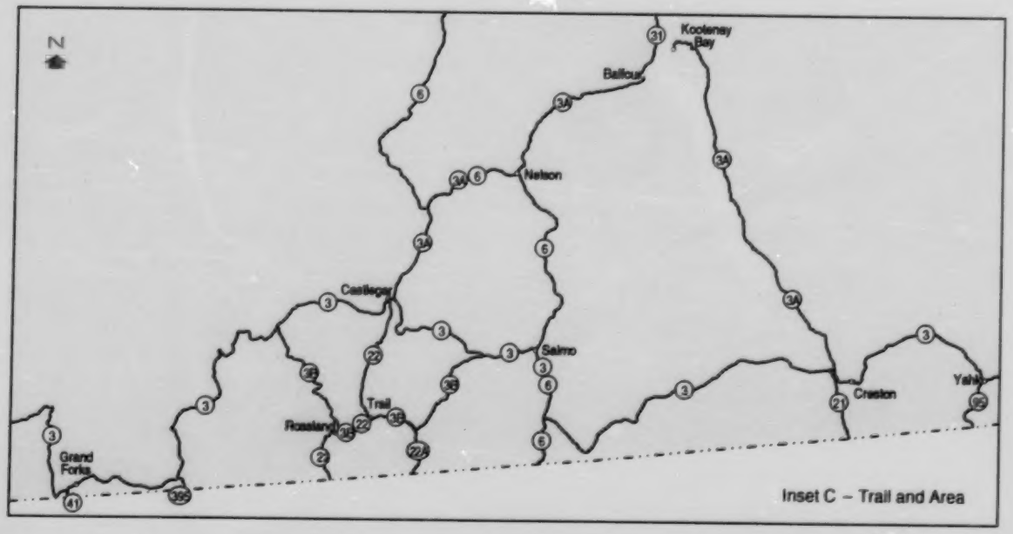
Wildlife accidents are recorded by the Ministry's Road and Bridge Maintenance Contractors located throughout British Columbia (Map 4). Data regarding wildlife-vehicle accidents, such as species and location, by Landmark Kilometre Inventory (LKI), are recorded on WARS forms H-107 (1999/01) (Appendix A). These forms are compiled by each Highway District office and then sent on a monthly basis to the Engineering Branch, HQ. The forms are screened, coded and then entered into the WARS database.

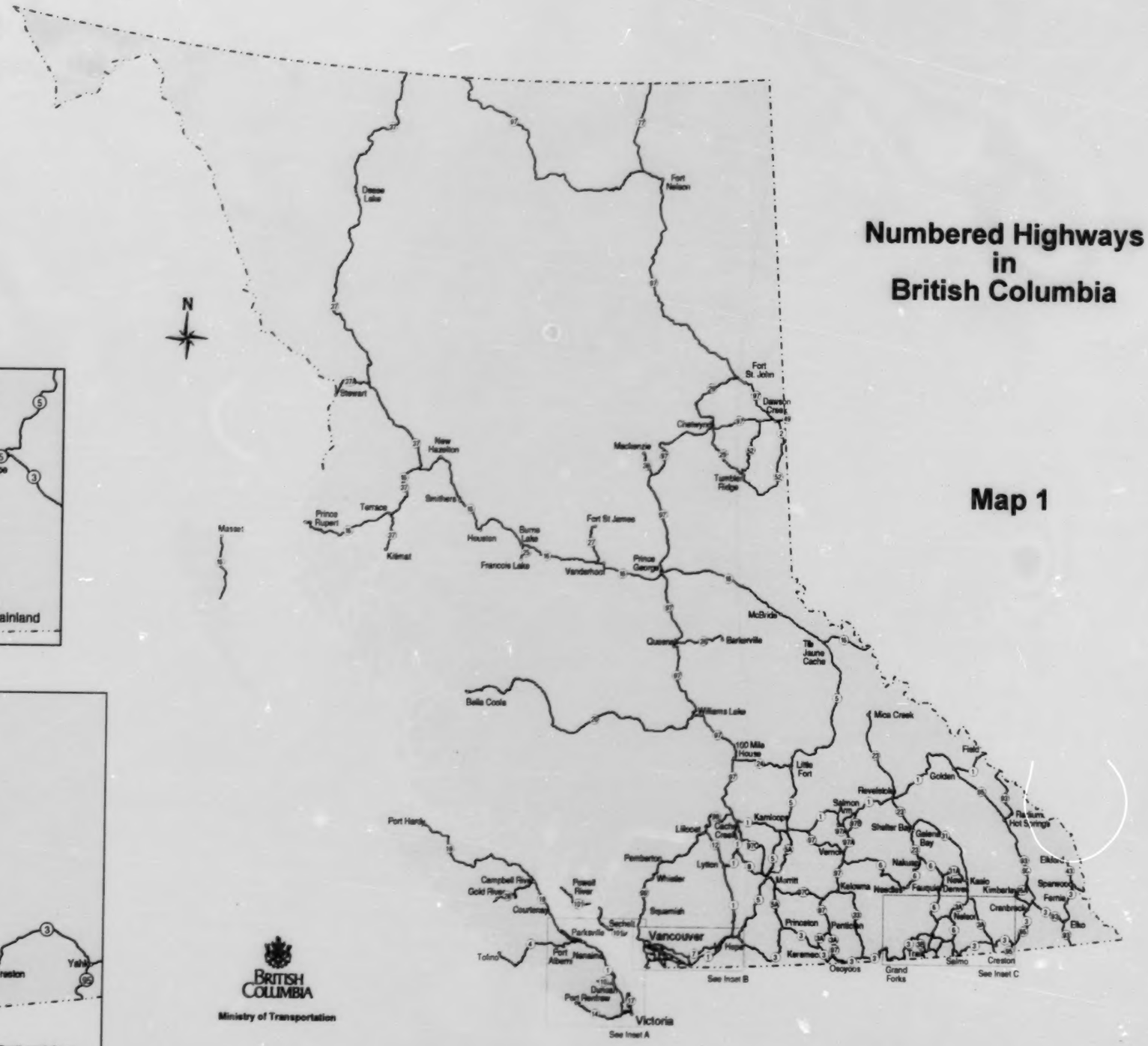
WARS forms are not completed for highways maintained by the Federal Government or the Yukon Government under agreements with the British Columbia Government. These are:

Highway 1 – Glacier National Park
Highway 1 – Mt. Revelstoke National Park
Highway 1 – Yoho National Park
Highway 4 - Pacific Rim National Park,
Highway 93 – Kootenay National Park
Highway 97 - Alaska Highway (to Yukon Border)
Highway 97 - Alaska Highway (Watson Lake to Iron Creek)
Highway 1 - Alaska Highway (Morley to Swift River)
Haines Highway
Skagway Highway









Numbered Highways in British Columbia

Map 1

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Ministry of Transportation

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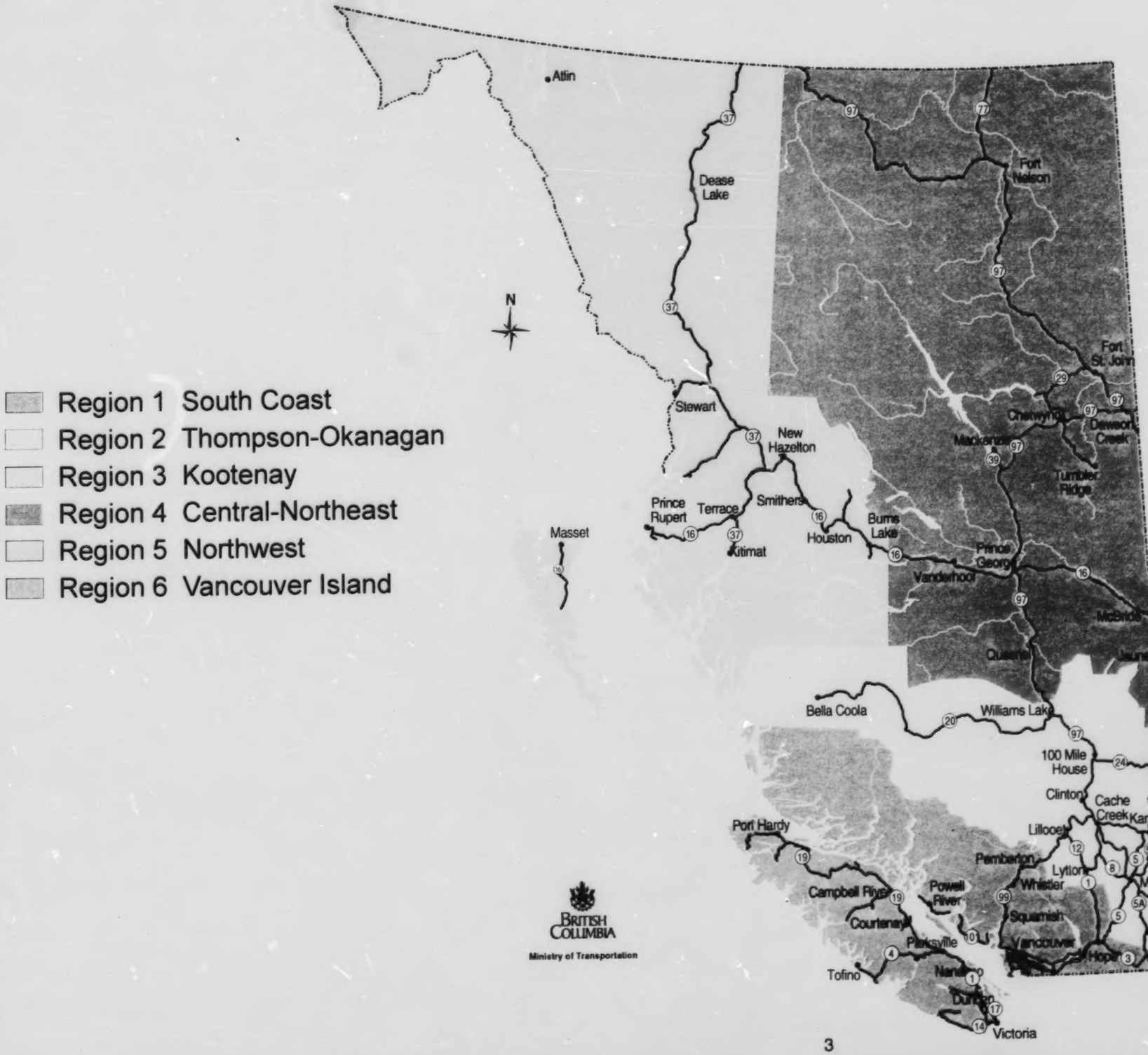
Transportation Regions and Major Highways of British Columbia

Map 2

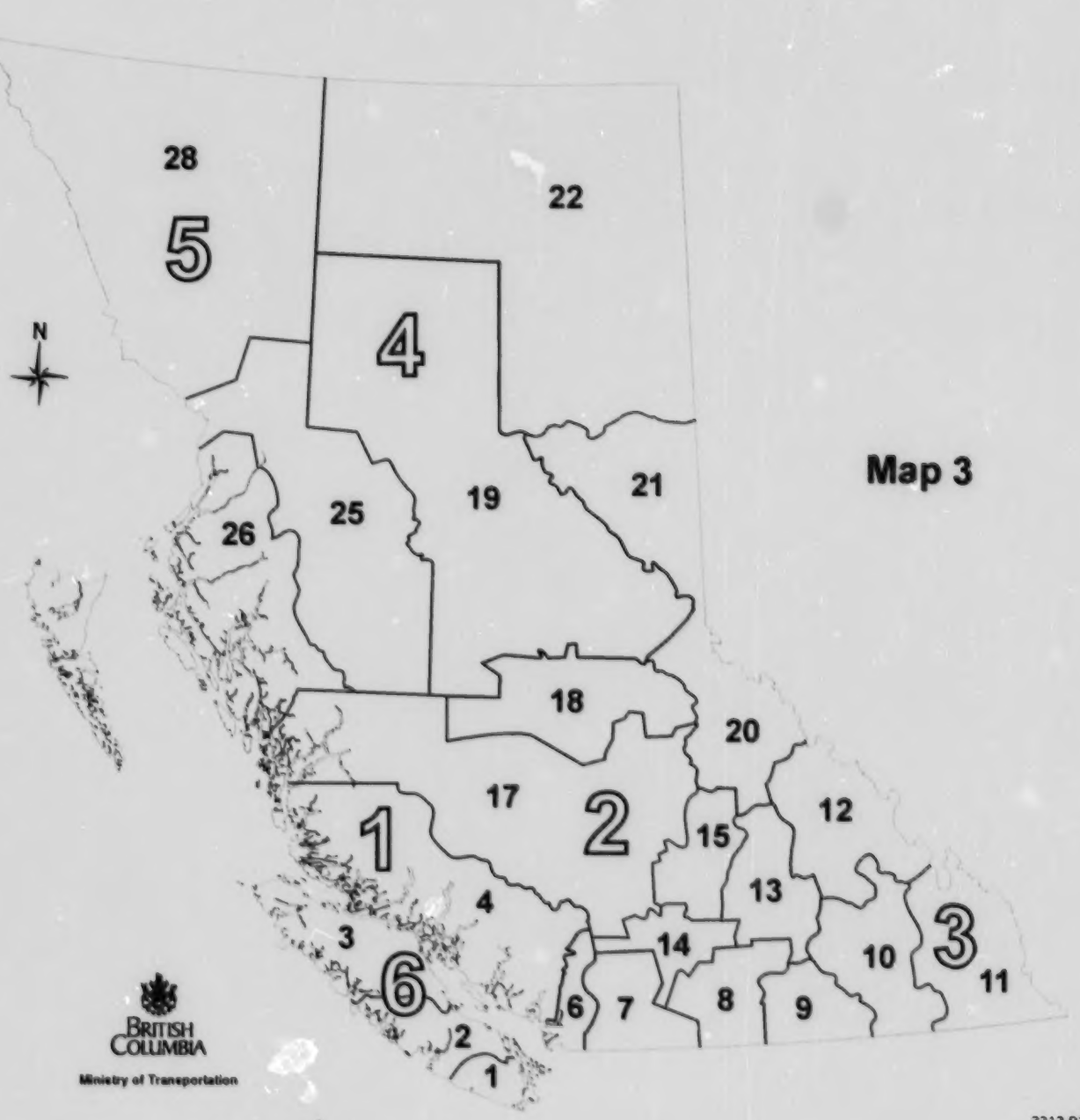


2313-03

Regional and District Boundary Map

1.	South Coast Region
2.	Thompson-Okanagan Region
3.	Kootenay Region
4.	Central-Northeast Region
5.	North West Region
6.	Vancouver Island Region

1.	South Island
2.	Central Island
3.	North Island
4.	Howe Sound
6.	Lower Mainland
7.	Fraser Valley
8.	South Okanagan
9.	Kootenay Boundary
10.	Central Kootenay
11.	East Kootenay
12.	Selkirk
13.	Okanagan-Shuswap
14.	Nicola
15.	Thompson
17.	Central Cariboo
18.	North Cariboo
19.	Fort George
20.	Robson
21.	South Peace
22.	North Peace
25.	Bulkley Nass
26.	Skeena
28.	Stikine

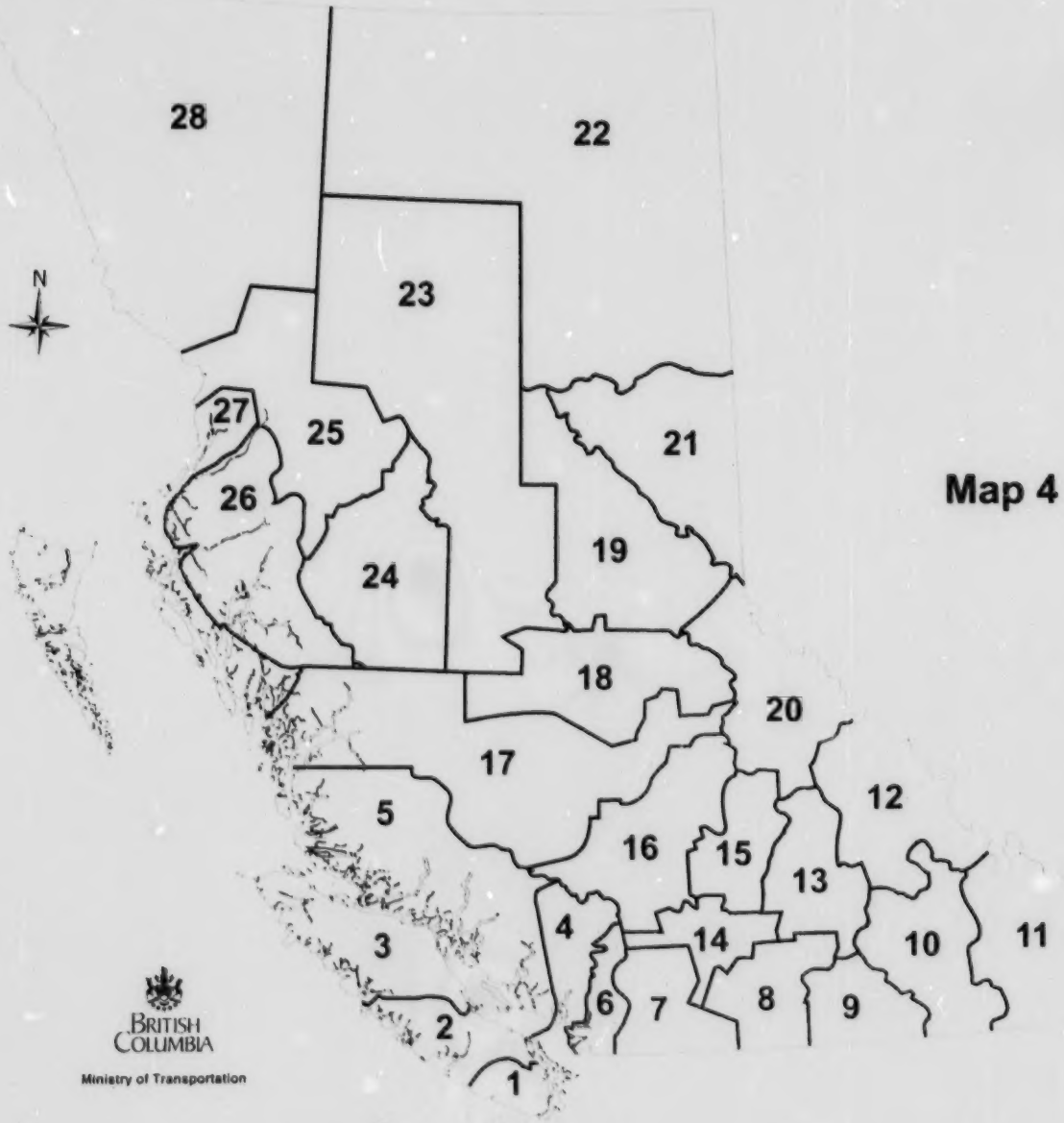


Map 3

2313-01

Road and Bridge Maintenance Service Areas

1.	South Island
2.	Central Island
3.	North Island
4.	Howe Sound
5.	Sunshine Coast
6.	Lower Mainland
7.	Fraser Valley
8.	South Okanagan
9.	Kootenay Boundary
10.	Central Kootenay
11.	East Kootenay
12.	Selkirk
13.	Okanagan-Shuswap
14.	Nicola
15.	Thompson
16.	South Cariboo
17.	Central Cariboo
18.	North Cariboo
19.	Fort George
20.	Robson
21.	South Peace
22.	North Peace
23.	Nechako
24.	Lakes
25.	Bulkley Nass
26.	Skeena
27.	North Coast
28.	Stikine



Map 4

2313-02a

Reporting

WARS is a flexible system which attempts to meet a broad range of requirements, from producing site specific reports over a few kilometres to creating detailed reports of various aspects of wildlife-vehicle accidents for the entire province. WARS data are used to produce annual reports for each calendar year and a wide range of adhoc reports. Annual reports provide detailed information and analyses of wildlife-vehicle accidents for a given year. Ten-year reports provide considerable information of wildlife-vehicle accidents over a decade and examine trends such as frequency, location and magnitude of accidents. Adhoc reports are created for people in need of specific information for particular species on selected highways. Approximately 30% of these inquiries are from MoT personnel. The remaining inquiries are made by other government agencies, consultants, researchers, news media, wildlife associations, and members of the general public.

Assumptions and Constraints

The Ministry estimates the number of wild animals recorded by the WARS system represents only about 25% to 35% of the actual number of wild animals killed. The low number of reports can be attributed to a number of factors. In high traffic areas, the remains of small species of wildlife, like badgers and raccoons, often become unrecognizable after being run over by a number of vehicles. Some animals, primarily deer, are removed from the roadside by passing motorists before they are recorded by MoT Maintenance Contractors.

Data is also lost due to the following:

- animals die outside the highway right-of-way,
- animal remains are removed by natural predators or scavengers,
- animal remains are obscured by snow, ice, vegetation, or roadside debris,
- errors and omissions in reporting accident locations and/or species type, and
- random and systematic errors and omissions in reporting and data processing.

WARS contains data on wildlife-vehicle accidents dating back to 1978. The data used in this report represents all the data for the 2000 reporting year received from District offices and Maintenance Contractors up until March 31, 2001.

Data Quality

The quality of the data contained in the WARS system is very dependent on the reporting diligence of the Ministry's Maintenance Contractors. Since wildlife accidents often occur at very untimely hours, under less than ideal weather conditions, comprehensive reporting at the accident scene is difficult at times.

In 2000, of the 4,768 reports received, 20% lacked valid segment numbers, and 31% lacked valid kilometre references. These reports did not contain enough information for Environmental Management Section staff to determine the valid segment numbers and km references. This was a significant improvement over 1995, when 28% lacked valid segment numbers and 44% lacked valid km references. The quality of reporting

continues to improve. When Wildlife Accident Report Forms are filled out correctly and consistently with the necessary LKI and km information, the value of the WARS data to the Ministry, Maintenance Contractors, and others increases.

The Maintenance Contractors' positive response to the new WARS forms H-107 (1999/01) appears to be addressing the issue of data completeness and accuracy. To date, the data provided on the new H-107 forms for 2000 is more complete and accurate, and thus more valuable for analysis and outcomes.

WARS data helps the Ministry direct its limited financial resources for wildlife accident mitigation to locations where it is most needed. The Insurance Corporation of British Columbia (ICBC) also uses WARS data to evaluate Ministry cost-sharing proposals for highway safety projects. Since each wildlife-related accident clean-up can cost hundreds of dollars in Maintenance Contractor staff and equipment time, the WARS system can direct Ministry attention to high wildlife accident locations to reduce the operating costs for Maintenance Contractors.

WARS Enhancements

In 1994, two notable enhancements were made to the system. The first of these was expanding on the Potential Hazard reporting function of the system. In addition to Potential Hazard Reports for specified highways, the system can now also produce Potential Hazard Reports by Province, Region and District. This function can identify where accidents are most likely to occur within the area of concern whether it is a particular highway or Region. The second enhancement involved the capability of the system to report on the location of wildlife mitigation measures throughout British Columbia. WARS now contains up-to-date information on the location of wildlife fencing, reflectors and wildlife warning signs throughout the Province. In 2000, additional functions were added to the WARS system to streamline database queries and make multi-year analysis of species-specific accidents easier.

Region and District Boundary Changes

Changes in the Region and District boundaries, which occurred between 1997 and 1999, are reflected in the information presented in this report.

- District 16 of Region 2 was amalgamated with District 17 of Region 4 to form District 17 in Region 2,
- In Region 4, District 19 was amalgamated with District 23 to form District 19, and
- In Region 5, District 24 was amalgamated with District 25 to form District 25.

In each amalgamated district, the Ministry Maintenance Contractors continue to collect WARS data separately for the Maintenance Contract Service Areas that remain in the former districts (Appendix B). The data is merged at Ministry Headquarters for reporting purposes.

WILDLIFE-RELATED MOTOR VEHICLE ACCIDENT FACTORS

The highway environment in British Columbia is a very complex and varied one, ranging from multi-lane freeways located in urban centres to two-lane highways transecting the undeveloped hinterland. British Columbia has a diverse number of wild animal species, ranging from seemingly ubiquitous deer to elusive wolves, each with their own highway interaction characteristics. Wildlife-related motor vehicle accidents have been recorded on highways throughout the Province. There are many related and unrelated, man-made and natural factors which may influence drivers and wildlife interactions, and affect highway conditions. Some of the factors identified, many difficult to measure and evaluate, are listed in Table 1.

Table 1. Wildlife-Related Motor Vehicle Accident Factors

1. Wildlife Characteristics	species, population, age, sex, stage of reproduction, nutritional needs, movement behavior, population cycles
2. Wildlife Activities	feeding, breeding, sleeping, migrating, evading predators, chasing prey
3. Natural Water Sources	intermittent and permanent streams, rivers, slews, lakes, ponds, springs, waterfalls
4. Man-made Water Sources	settling ponds, surface drainage systems, wells, dugouts
5. Natural Food Sources	natural vegetation, salt licks, fish-bearing waters, prey
6. Man-made Food Sources	orchards, gardens, fields, pets, livestock, garbage
7. Wildlife Shelter	caves, cliffs, forests, culverts, bridges
8. Habitat Conditions	seasonal vegetation changes, snow depth, drought, flooding, fire, overgrazing
9. Traffic	volume, speed, composition, time-of-day, time-of-year
10. Vehicles	size, design, operating condition, brakes, lights, horns
11. Drivers	wildlife hazard awareness, highway familiarity, general alertness, driving skill, response time, response actions
12. Highway Design	road width, number of lanes, curvilinearity of alignment, right-of-way width, shoulder width, ditch depth, pavement surface, lighting
13. Roadside Management and Maintenance	native and non-native right-of-way vegetation, weed control, mowing, brushing, ditching, snow removal, de-icing, sign and reflector repairs
14. Roadside Development	natural, urban, suburban, rural
15. Accident Mitigation Devices	wildlife signs, fencing, under/overpasses, reflectors
16. Topography	elevation, cliffs, slopes, plains, undulating terrain
17. Weather	rain, snow, sleet, fog, haze, smoke, wind, cloud cover
18. Time of Day	dawn, day, dusk, night, length of day/night
19. Lunar Cycle	phases of the Moon, intensity of Moonlight
20. Human Activities Outside Right-of-Way-	construction, forestry, farming, mining, hunting, off-road recreation

REGIONAL AND DISTRICT ACCIDENT STATISTICS

Overview

In 2000, MoT Maintenance Contractors reported 4,768 wildlife-vehicle accidents. This is a decrease of 2.4% from 2000 (Table 2). The increase can be contributed to a variety of factors including seasonal climatic variations, increasing animal populations, and changes in migratory patterns.

Table 2. Wildlife Accidents in B.C. (1991 to 2000)

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Accidents	3306	3176	4680	5262	4764	3853	3661	4576	4888	4768

Figure 1 illustrates the ten year trend for reported wildlife-vehicle accidents. It appears the accident rate has decreased slightly, after a two year period of increases. The highest number of accidents in the last decade occurred in 1994. The 1994 and 1999 peaks may be attributed to correlated longer term climatic patterns, seasonal animal behavior, or fluctuating traffic volumes.

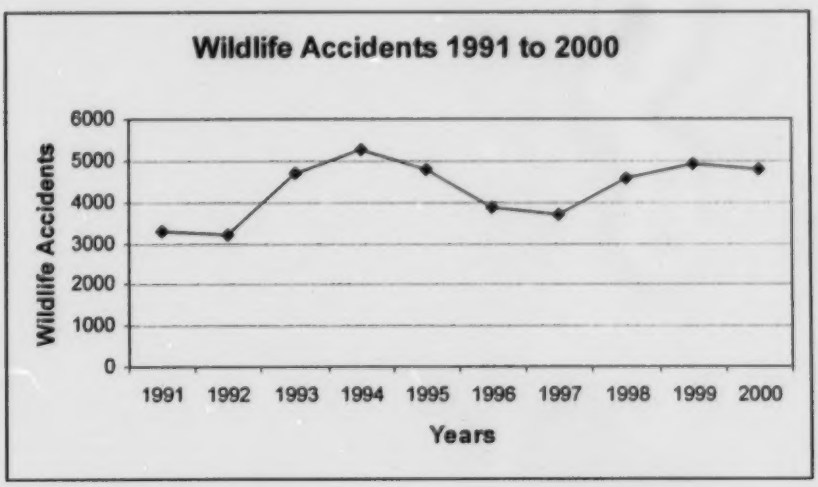


Figure 1. Wildlife Accidents (1991 to 2000)

Regional Comparisons

Table 3 provides a breakdown of wildlife accidents by Regions from 1991 to 2000. Given the size of the province and the dramatically different climatic and geographical regimes within each region, variations between regions may vary significantly. For example, depending on weather patterns, Region 6 can experience a very wet winter but exhibit fewer wildlife accidents, while Regions 2 and 3 can experience heavy snowfalls with higher wildlife accidents as animals migrate from higher elevations to valleys where highways are located.

Table 3. Wildlife Accidents by Region (1991 to 2000)

Region	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Totals
1	83	254	291	232	232	157	159	179	201	258	**2,046**
2	683	588	895	754	877	711	952	1,139	1,026	920	**8,545**
3	1,367	1,044	1,702	2,268	1,649	1,411	955	1,307	1,501	1,461	**14,665**
4	488	511	812	1,063	1,083	673	608	891	953	918	**8,000**
5	190	153	181	194	190	162	211	182	220	204	**1,887**
6	495	656	799	751	733	739	765	878	987	1,001	**7,804**
Totals	**3,306**	**3,176**	**4,680**	**5,262**	**4,764**	**3,853**	**3,650**	**4,576**	**4,888**	**4,762**	**42,917**

When comparing 2000 wildlife-vehicle accidents by Region to those during previous years, it is important to note, the fluctuation between years can be considerable (Table 4).

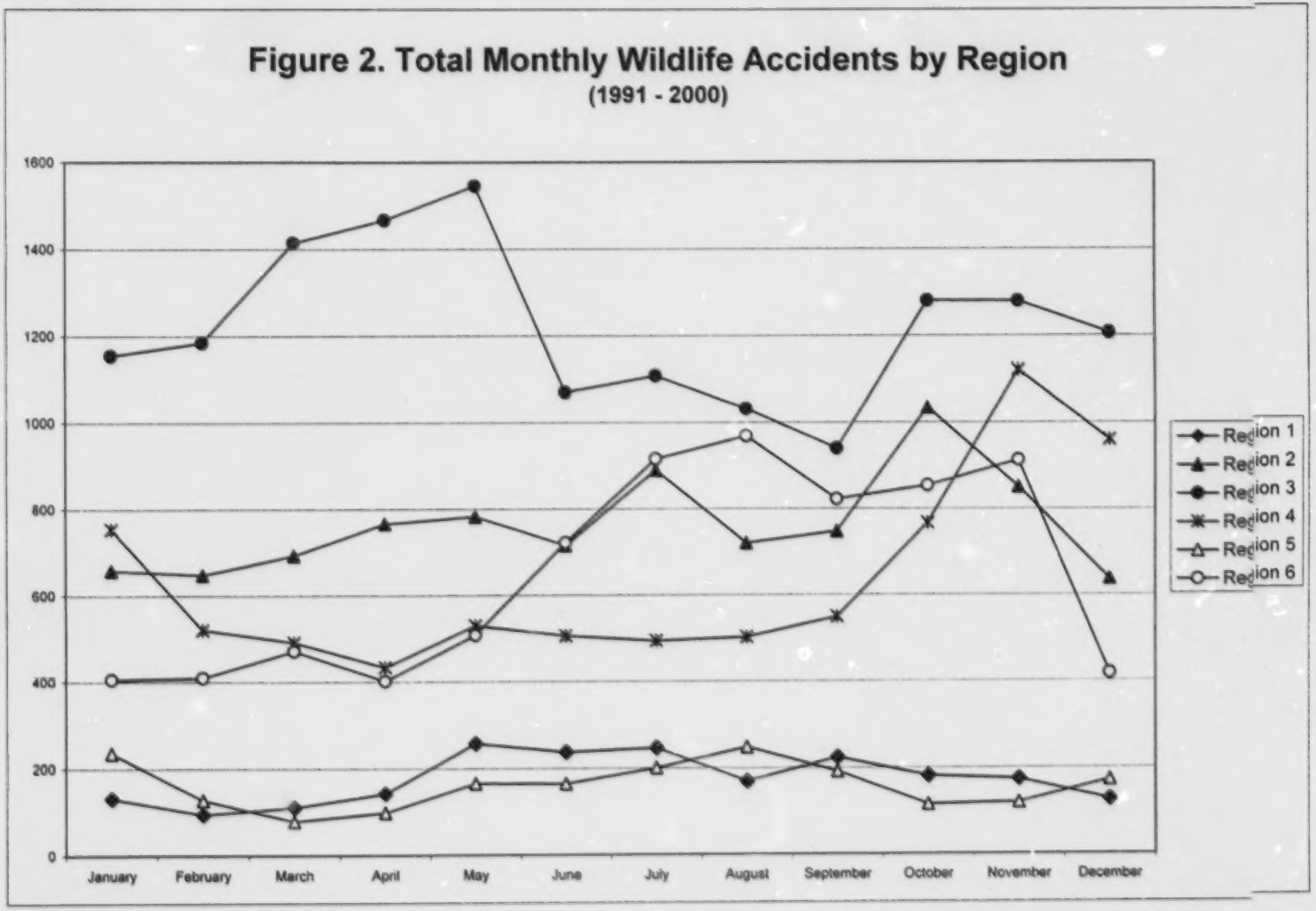
Table 4. Regional Wildlife Accidents Comparisons (1996 to 2000)

Region	1996	1997	% Change	1997	1998	% Change	1998	1999	% Change	1999	2000	% Change
1	157	159	**+1.3**	159	179	**+12.6**	179	201	**+12.3**	201	258	**+28.4**
2	711	952	**+33.9**	952	1,139	**+19.6**	1,139	1,026	**-9.9**	1,026	920	**-10.3**
3	1,411	955	**-32.3**	955	1,307	**+36.9**	1,307	1,501	**+14.8**	1,501	1,461	**-2.7**
4	673	608	**-9.7**	608	891	**+46.5**	891	953	**+7.0**	953	918	**-3.7**
5	162	211	**+30.2**	211	182	**-13.7**	182	220	**+20.9**	220	204	**-7.3**
6	739	765	**+3.5**	765	878	**+14.8**	878	987	**+12.4**	987	1,001	**+1.4**
Total	3,853	3,650	**-5.3**	3,650	4,576	**+25.4**	4,576	4,888	**+6.8**	4,888	4,762	**-2.6**

When the monthly distribution of wildlife-vehicle accidents for all species in each Region for the period between 1991 and 2000 are compared, trends appear (Figure 2). Collectively, the accident rate for all Regions peaks in May and November. Since deer represent approximately 80% of the animals killed, the patterns of accidents for other species is overshadowed by the pattern found for deer in all Regions.

The general pattern of wildlife accidents for the entire Province is greatly influenced by the number of deer-vehicle accidents recorded in Region 3. This Region has disproportionately more accidents than any other Region. The general pattern of Region 3 is reinforced by similar patterns observed in Regions 2 and 4. Regions 2, 3 and 4 have some of the highest deer populations in the Province. These Regions have areas with steep mountainous terrain transected by Highways 1, 3, 16 and 97. The trend observed in Region 6 (Vancouver Island) differs from the other Regions with no peak in May, but a peak in August.

Figure 2. Total Monthly Wildlife Accidents by Region
(1991 - 2000)



District Comparisons

Table 5 provides a breakdown of wildlife-vehicle accidents as recorded by Districts. The distribution ranges from 39 wildlife-vehicle accidents recorded in District 6 to 639 recorded in District 11. Given the varying District sizes, geography, highway infrastructures, and bioclimatic regimes, great variations in wildlife accident rates occur between Districts (Table 6.).

Table 5. Annual District Wildlife Accident Comparisons (1991 to 2000)

District	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Total
1	145	189	304	266	351	275	273	297	310	314	**2,724**
2	19	91	153	160	130	210	224	268	301	266	**1,822**
3	17	113	197	337	252	254	255	313	362	427	**2,527**
4	7	62	88	38	39	34	28	34	89	129	**548**
6	6	18	38	50	80	43	8	50	38	39	**370**
7	9	98	131	106	113	80	81	95	74	90	**877**
8	115	148	292	153	318	272	358	334	287	297	**2,574**
9	538	297	504	778	602	520	322	517	523	538	**5,139**
10	445	157	429	515	415	348	202	247	305	217	**3,280**
11	278	279	447	853	547	454	347	511	584	639	**4,939**
12	94	57	76	122	85	89	45	32	75	67	**742**
13	156	144	175	275	237	126	98	244	215	192	**1,862**
14	107	79	88	94	90	118	60	75	90	84	**885**
15	90	52	60	101	109	80	115	125	139	119	**990**
17	178	110	209	259	215	221	272	361	286	228	**2,339**
18	3	9	0	0	98	165	142	145	167	139	**868**
19	101	45	102	174	111	33	53	77	83	56	**835**
20	57	66	119	138	122	103	65	146	222	166	**1,204**
21	163	133	218	514	607	266	290	492	410	479	**3,572**
22	70	15	96	109	53	0*	32	31	76	78	**560**
25	62	58	71	183	158	127	89	89	128	113	**1,078**
26	106	29	38	0*	19	31	104	89	76	47	**539**
28	16	7	0	11	13	4	1	4	13	44	**113**

* Records missing

Table 6. Annual Wildlife Accident Variation by District

District	1997	1998	1997/1998 % Change	1998	1999	1998/1999 % Change	1999	2000	1999/2000 % Change
1	273	297	+8.8	297	310	+4.4	310	314	+1.3
2	224	268	+19.6	268	301	+12.3	301	266	-13.2
3	255	313	+22.7	313	362	+15.7	362	427	+15.2
4	28	34	+21.4	34	89	+161.2	89	129	+31.0
6	8	50	+525.0	50	38	-24.0	38	39	+2.6
7	81	95	+17.3	95	74	-22.1	74	90	+17.8
8	358	334	-6.7	334	287	-14.1	287	297	+3.4
9	322	517	+60.6	517	523	+1.2	523	538	+2.8
10	202	247	+22.3	247	305	+23.5	305	217	-40.6
11	347	511	+47.3	511	584	+14.3	584	639	+8.6
12	45	32	-28.9	32	75	+134.4	75	67	-11.9
13	98	244	+149.0	244	215	-11.9	215	192	-12.0
14	60	75	+25.0	75	90	+20.0	90	84	-7.1
15	115	125	+8.7	125	139	+11.2	139	119	-16.8
17	272	361	+32.7	361	286	-20.8	286	228	-25.4
18	142	145	+2.1	145	167	+15.2	167	139	-20.1
19	53	77	+45.3	77	83	+7.8	83	56	-48.2
20	65	146	+124.6	146	222	+52.1	222	166	-33.7
21	290	492	+69.7	492	410	-16.7	410	479	+14.4
22	32	31	-3.1	31	76	+145.2	76	78	+2.6
25	89	89	0.0	89	128	+43.8	128	113	-13.3
26	104	89	-14.4	89	76	-14.6	76	47	-61.7
28	1	+4	300.0	4	13	+225.0	13	44	+70.5

Highway Comparisons within Districts

Table 7 provides a 10 year comparison breakdown of wildlife-vehicle accidents as recorded by Ministry Maintenance Contractors within each District. Highways 1, 3, 16 and 97 have the highest number of recorded wildlife-vehicle accidents. These highways are the longest in the province, carrying the greatest volumes of traffic, and traversing many of the major wildlife habitats.

Table 7. Wildlife Accidents by District and Highway (1991-2000)

REGION 1

District 4 – Howe Sound ([1]Service Area 4 – Howe Sound, [2]Service Area 5 – Sunshine Coast, [3]Both, *Records Missing)											
Highway	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Totals
1[1]	0	6	1	2	2	7	0*	2	2	7	29
99[1]	7	32	23	28	16	30	0*	1	16	1	154
101[2]	8	17	26	15	25	18	4	13	23	25	174
Various[3]	2	36	47	32	30	28	24	18	48	96	361
Totals	17	91	97	77	73	83	28	34	89	129	718

District 6 – Lower Mainland											
Highway	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Totals
1	0	23	29	27	12	10	4	7	0	5	117
7	0	3	2	6	5	17	6	3	13	7	62
10	0	2	5	4	1	1	1	1	0	1	16
15	0	1	1	2	0	0	0	2	0	0	6
99	1	12	6	3	9	1	1	3	1	4	41
Various	5	7	3	8	19	14	4	34	22	22	138
Totals	6	48	46	50	46	43	16	50	36	39	380

District 7 – Fraser Valley											
Highway	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Totals
1	14	62	73	58	60	57	37	62	33	44	500
3	33	32	43	40	37	12	31	18	21	25	292
5	7	7	14	1	3	2	6	0	0	1	41
7	4	1	7	5	6	4	5	6	2	10	50
9	0	0	0	1	0	0	0	0	0	0	1
11	0	3	1	1	0	2	2	2	0	1	12
Various	2	10	10	0	7	3	26	7	18	9	92
Totals	60	115	148	106	113	80	107	95	74	90	988

REGION 2

District 8 – South Okanagan											
Highway	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**Totals**
3	84	52	112	47	92	66	51	60	87	90	**741**
3A	8	14	21	19	33	29	6	18	10	27	**185**
3B	3	2	4	2	5	3	3	3	0	5	**30**
5A	6	3	13	4	24	10	1	6	11	15	**93**
33	14	13	35	5	19	15	20	30	29	24	**204**
97	111	59	160	51	96	123	260	161	95	95	**1,211**
97C	1	0	0	3	3	0	0	0	0	0	**7**
Various	19	20	37	23	46	26	52	56	56	41	**376**
Totals	**246**	**163**	**382**	**154**	**318**	**272**	**393**	**334**	**288**	**297**	**2,847**

District 13 – Okanagan-Shuswap											
Highway	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**Totals**
1	26	19	14	50	40	20	23	29	58	40	**319**
6	64	76	94	128	99	62	27	56	45	48	**699**
97	7	2	1	13	13	8	16	75	37	44	**216**
97A	19	8	24	17	43	13	26	21	20	17	**208**
97B	2	1	1	1	0	0	1	0	3	1	**10**
Various	38	38	62	66	42	23	12	63	55	42	**441**
Totals	**156**	**144**	**196**	**275**	**237**	**126**	**105**	**244**	**218**	**192**	**1,893**

District 14 – Nicola											
Highway	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**Totals**
1	0	1	4	3	10	17	6	3	7	9	**60**
5	90	62	67	44	44	50	22	42	52	39	**512**
5A	0	2	8	15	8	5	7	3	1	7	**56**
8	0	0	3	7	2	3	1	5	1	0	**22**
97C	7	6	8	16	16	26	14	17	22	18	**150**
Various	10	8	2	9	10	17	20	5	10	11	**102**
Totals	**107**	**79**	**92**	**94**	**90**	**118**	**70**	**75**	**93**	**84**	**902**

District 15 – Thompson											
Highway	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Totals
1	27	26	29	37	43	34	57	56	50	39	398
5	49	54	35	56	62	44	67	57	75	47	546
5A	7	2	0	0	1	1	4	0	1	0	16
24	2	1	0	1	0	0	3	4	4	14	29
Various	5	13	12	7	3	1	4	8	9	19	81
Totals	90	96	76	101	109	80	135	125	139	119	1,070

District 17 – Cariboo ([1]Service Area 16 - South Cariboo, [2]Service Area 17 – Central Cariboo, [3]Both)											
Highway	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Totals
1[1]	8	11	6	21	20	11	5	12	5	4	103
12[1]	4	1	1	3	3	0	0	1	0	0	13
20[2]	33	25	32	49	28	25	56	39	37	50	374
24[1]	9	14	22	17	11	19	17	28	23	15	175
97[3]	84	62	114	96	80	121	142	200	145	113	1,157
97C[1]	0	0	3	1	2	1	0	0	1	2	10
99[1]	0	0	8	8	5	0	1	1	2	0	25
Various[3]	40	35	58	63	66	44	64	80	75	44	569
Totals	178	148	244	258	215	221	285	361	288	228	2,426

REGION 3

District 9 – Kootenay Boundary											
Highway	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Totals
3	248	218	284	387	299	304	186	318	272	298	2,814
3A	6	1	10	4	5	5	3	1	0	0	35
3B	30	5	10	35	9	6	6	4	0	0	105
22	39	19	35	61	38	21	5	0	1	0	219
22A	1	0	0	0	0	0	0	1	0	0	2
33	187	99	192	225	176	147	95	139	175	154	1,589
Various	27	28	56	65	75	37	31	54	85	86	544
Totals	538	370	587	777	602	520	326	517	533	538	5,308

District 10 – Central Kootenay											
Highway	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Totals
3	111	52	110	119	53	57	36	68	81	49	736
3A	88	4	109	141	104	81	38	40	42	47	694
6	154	76	155	160	178	155	113	99	137	90	1,317
21	0	1	1	4	1	0	0	4	2	0	13
23	23	17	47	13	17	10	3	3	9	5	147
31	42	6	47	39	39	31	15	20	17	6	262
31A	0	4	3	10	9	5	1	5	4	0	41
Various	32	71	22	29	14	9	12	8	14	20	231
Totals	450	231	494	515	415	348	218	247	306	217	3,441

District 11 – East Kootenay											
Highway	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Totals
3	164	176	226	478	254	218	131	213	230	242	2,332
43	16	10	18	20	45	22	13	24	6	27	201
93	21	47	61	70	54	44	42	63	157	148	707
95	49	91	142	161	114	117	87	143	68	50	1,022
95A	23	33	39	94	62	43	26	30	63	62	475
Various	5	11	27	30	18	10	40	38	63	110	352
Totals	278	368	513	853	547	454	339	511	587	639	5,089

District 12 – Selkirk											
Highway	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Totals
1	43	32	72	67	54	44	35	25	43	20	435
23	28	13	9	18	9	16	7	12	4	1	117
31	0	7	2	1	0	0	0	1	0	0	11
95	19	20	23	29	1	20	9	20	16	36	193
Various	11	3	2	7	21	9	0	9	12	10	84
Totals	101	75	108	122	85	89	51	67	75	67	840

REGION 4

District 18 – North Cariboo											
Highway	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Totals
26	0	0	5	14	3	16	13	8	7	3	69
97	3	9	103	66	85	137	106	128	142	115	894
Various	0	0	10	8	10	12	26	9	18	21	114
Totals	3	9	118	88	98	165	145	145	167	139	1,077

District 19 – Fort George ([1]Service Area 19 – Fort George, [2]Service Area 23 – Nechako, [3]Both)											
Highway	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Totals
16[2]	23	28	70	75	50	19	37	40	42	28	412
27[2]	0	0	3	7	1	3	3	0	0	2	19
39	1	2	3	0	3	0	0	1	3	2	15
97[3]	75	20	48	62	37	8	12	20	19	21	322
Various[3]	3	30	11	30	20	3	8	16	19	3	139
Totals	101	80	132	174	111	33	60	77	83	56	907

District 20 – Robson											
Highway	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Totals
5	20	42	46	55	37	32	30	36	89	60	447
16	29	58	70	80	84	69	44	100	108	99	741
Various	8	5	16	3	1	2	3	10	24	7	79
Totals	57	105	132	138	122	103	77	146	221	166	1,267

District 21 – South Peace											
Highway	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Totals
2	15	11	53	54	57	37	37	69	42	56	431
29	24	25	44	56	62	19	14	35	18	38	335
49	4	7	13	26	66	23	31	32	17	19	238
52	2	17	21	12	24	13	17	27	9	19	161
97	95	109	155	262	333	147	135	277	285	304	2,102
Various	22	26	55	93	65	27	66	52	40	43	489
Totals	162	195	341	503	607	266	300	492	411	479	3,756

District 22 – North Peace (*Records Missing – all 1996 monthly WARS reports for District 22 were accidentally lost)											
Highway	**1991**	**1992**	**1993**	**1994**	**1995**	**1996***	**1997**	**1998**	**1999**	**2000**	**Totals**
29	24	15	24	17	11	0	10	6	3	3	**113**
97	27	17	43	34	13	0	8	17	45	44	**248**
Various	20	18	45	58	29	0	15	8	28	31	**252**
Totals	**71**	**50**	**112**	**109**	**53**	**0**	**33**	**31**	**76**	**78**	**613**

REGION 5

District 25 – Bulkley-Lakes ([1]Service Area 24 – Lakes, [2]Service Area 25 - Bulkley-Nass, [3]Both)											
Highway	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**Totals**
16[3]	24	72	94	126	73	73	63	68	84	69	**751**
35[1]	4	1	3	8	8	6	0	4	4	4	**42**
37[2]	13	15	22	23	27	17	21	7	24	12	**181**
37A[2]	9	3	4	0	21	8	1	0	3	6	**55**
Various[3]	13	14	20	26	29	18	12	10	12	22	**176**
Totals	**63**	**105**	**143**	**183**	**158**	**127**	**97**	**89**	**127**	**113**	**1,205**

District 26 – Skeena ([1]Service Area 26 – Skeena, [2]Service Area 27 – North Coast, [3]Both) (*Records Missing – all 1994 monthly WARS reports for District 26)											
Highway	**1991**	**1992**	**1993**	**1994***	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**Totals**
16[3]	43	10	24	0	14	10	90	81	44	33	**349**
37[1]	26	5	9	0	4	14	22	2	15	0	**97**
Various[3]	37	21	5	0	1	7	7	6	19	14	**117**
Totals	**106**	**36**	**38**	**0**	**19**	**31**	**119**	**89**	**78**	**47**	**563**

District 28 – Stikine											
Highway	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**Totals**
37	10	11	0	11	13	4	1	4	8	31	**93**
Various	11	1	0	0	0	0	0	0	7	13	**32**
Totals	**21**	**12**	**0**	**11**	**13**	**4**	**1**	**4**	**15**	**44**	**125**

REGION 6

District 1 – South Island											
Highway	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**Totals**
1	88	97	110	77	55	77	102	102	89	109	**906**
1A	0	3	2	0	0	0	4	0	0	4	**13**
14	36	33	60	30	25	25	29	34	25	26	**323**
17	5	9	1	9	27	7	8	9	5	9	**89**
17A	0	0	1	2	0	0	3	0	0	0	**6**
18	8	2	12	14	0	0	8	13	19	6	**82**
Various	83	157	156	131	244	166	117	139	174	160	**1,527**
Totals	220	301	342	263	351	275	271	297	312	314	**2,946**

District 2 – Central Island											
Highway	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**Totals**
1	15	6	9	12	7	18	15	17	12	8	**119**
4	10	14	63	26	22	21	18	7	12	17	**210**
4A	0	1	0	2	0	1	0	1	3	4	**12**
18	2	4	4	3	0	0	3	3	1	0	**20**
19	49	78	84	36	35	89	109	83	115	68	**746**
19A*	N/A	N/A	N/A	N/A	N/A	N/A	7	1	14	23	**45**
Various	27	45	43	87	66	81	89	156	145	146	**885**
Totals	103	148	203	166	130	210	241	268	302	266	**2,037**

District 3 – North Island											
Highway	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**Totals**
19	99	126	136	154	117	125	117	170	190	215	**1,449**
19A*	N/A	N/A	N/A	N/A	N/A	N/A	1	0	7	34	**42**
28	7	3	14	11	11	5	4	8	8	7	**78**
Various	66	78	104	157	124	124	122	135	166	171	**1,247**
Totals	172	207	254	322	252	254	244	313	371	427	**2,816**

* In some locations, new sections of the Inland Island Highway are being constructed parallel to the old Highway 19 alignment. As these sections of the Inland Island Highway are opened, they are designated as Highway 19 and the corresponding parallel sections of the original Highway 19 are designated Highway 19A.

WILDLIFE ACCIDENT LOCATIONS

Wildlife Accident Location Reporting

Accurate reporting of wildlife accident locations is critical for effectively identifying and evaluating accident patterns. Historically, not all WARS report forms have been completed with diligence. In particular, the accuracy of accident locations has varied considerably. In 1995, 28% of the WARS report forms lacked valid segment numbers and 44% lacked valid km references. The situation is improving. In 2000, 20% of the report forms received lacked valid LKI segment numbers and 31% lacked valid LKI kilometre references.

Some confusion exists between the use of the Road Features Inventory (RFI) and the LKI systems for identifying wildlife accident locations. Ministry Maintenance Contractors use the RFI system for locating highway features and structures such as bridges, signs, etc. The WARS system uses the LKI system for locating wildlife accidents. Wildlife accidents reported with RFI references are often converted to LKI references by Ministry Maintenance Contractors staff or Ministry staff. Errors can occur during data conversion.

The impact of the lack of accurate location information on accident analysis has been compounded by earlier problematic data entry procedures at MoT Headquarters. Previously, if a kilometre reference was not reported for an accident, the value "0" was often entered into the WARS database for the kilometre reference. This reduced the quality of the WARS database location information by confusing accidents that occurred at the beginning of an LKI segment with those accidents with incomplete location information.

At this time, while it is very unlikely wildlife accidents occur uniformly along any segment of highway in British Columbia, the most accurate way to display accidents recorded in the WARS database provincially is by the LKI segment. Within each LKI segment, it is most probable certain locations experience higher than average wildlife-related accident rates. Such locations can only be identified when wildlife accidents are consistently reported with accurate and complete kilometre references. Ideally, Geographic Positioning System (GPS) devices could be used to establish much more accurate locations.

Wildlife Accident Location Rankings by Species

Wildlife-related motor vehicle accidents vary dramatically by location in British Columbia. Depending on where highways are located within specific wildlife habitats, accident rates vary for the different wild animal species. Table 8 shows the ten LKI segments of numbered Provincial highways with the highest accident rates per km per year, for deer, moose, elk, bear, sheep, coyote, and porcupines, for the period between 1991 and 2000.

Wildlife Accident Locations by Species Maps

The general locations of wildlife accidents for deer, moose, bear, elk, coyote, sheep and porcupine, reported by LKI segment numbers on numbered Provincial highways, are shown on Maps 5 through 18. Maps 5, 7, 9, 11, 13, 15, and 17 show the gross numbers of wildlife accidents reported on each segment from 1991 to 2000. Maps 6, 8, 10, 12, 14, 16, and 18 show wildlife accidents as distributed per kilometre per year between 1991 to 2000.

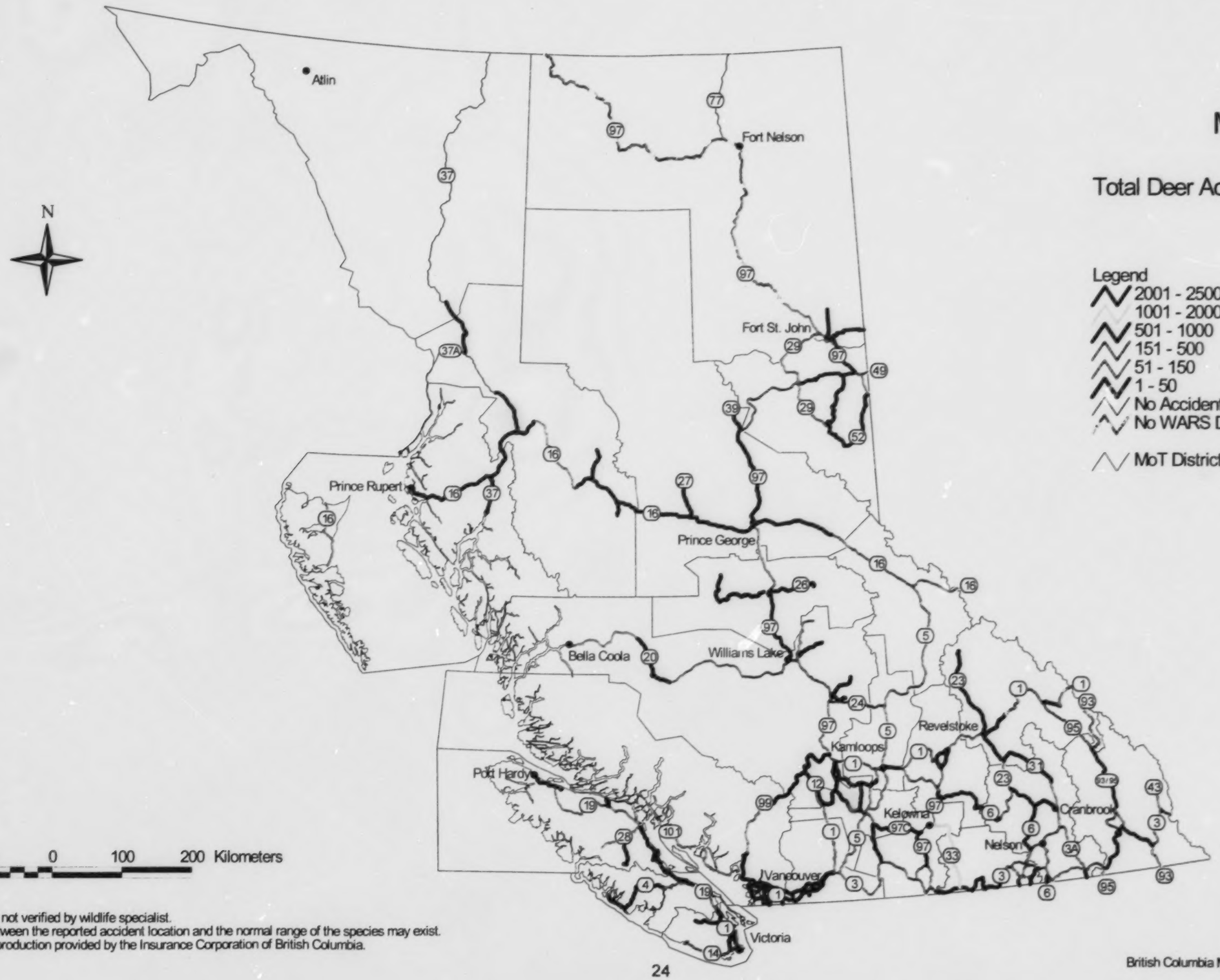
Table 8. Top Ten Wildlife Accident Location Rankings by Species (Accidents/km/year) (1991 to 2000)

DEER	Rank	Highway	LKI Segment	Description	Length (km)	Accidents/km/year	Total
	1	3	1325	OSOYOOS - CASCADE	147.21	1.683	2477
	2	97	1115	KALEDEN (JCT 3A) - DROUGHT HILL I/C (JCT RTE 97C)	57.61	1.486	856
	3	49	1197	DAWSON CREEK - ALBERTA	15.81	1.392	220
	4	33	1327	ROCK CREEK - RUTLAND	128.88	1.370	1766
	5	3/93	1385	CRANBROOK - ELKO	52.94	1.215	643
	6	3/95	1380	YAHK - CRANBROOK	71.94	1.154	830
	7	5A	1710	RTE 97C/5A ASPEN GROVE TO COLDWATER I/C	23.65	0.888	210
	8	3A	1363	NELSON - BALFOUR	33.90	0.876	297
	9	95A	2115	CRANBROOK - WASA	55.40	0.850	471
	10	3	1375	CRESTON - YAHK	40.00	0.828	331
MOOSE	**Rank**	**Highway**	**LKI Segment**	**Description**	**Length (km)**	**Accidents/km/year**	**Total**
	1	97	1175	DAWSON CREEK - FORT ST JOHN	72.73	0.252	183
	2	16	1570	PRINCE GEORGE: RTE 97 ON BYPASS - BOEING RD	8.60	0.221	19
	3	16	1580	DOME CREEK - TETE JAUNE	146.27	0.158	231
	4	16	1590	TETE JEUNE - ALBERTA	76.99	0.155	119
	5	16	1540	HOUSTON - BURNS LAKE	81.28	0.116	94
	6	5	1780	AVOLA - TETE JAUNE	147.95	0.105	156
	7	16	1575	PRINCE GEORGE - DOME CREEK	120.19	0.104	125
	8	97	1170	CHETWYND - DAWSON CREEK	100.02	0.103	103
	9	16	1520	HAZELTON - HOUSTON	131.69	0.980	1291
	10	97	1160	PARSNIP RIVER - CHETWYND	149.26	0.878	1311
ELK	**Rank**	**Highway**	**LKI Segment**	**Description**	**Length (km)**	**Accidents/km/year**	**Total**
	1	3/93	1385	CRANBROOK - ELKO	52.94	0.196	104
	2	3	1395	ELKO - ALBERTA	80.45	0.185	149
	3	93/95	2140	WASA - RADIUM	102.51	0.141	145
	4	3/95	1380	YAHK - CRANBROOK	71.94	0.115	83
	5	93/95	2135	FORT STEELE - WASA	31.66	0.114	36
	6	43	1397	SPARWOOD - ELKFORD	34.56	0.081	28
	7	3	1375	CRESTON - YAHK	40.00	0.080	32
	8	93	2150	RADIUM - KOOTENAY PARK	1.27	0.079	1
	9	41	1326	USA BORDER - GRAND FORKS	1.29	0.078	1
	10	95A	2115	CRANBROOK - WASA	55.40	0.069	38
BEAR	**Rank**	**Highway**	**LKI Segment**	**Description**	**Length (km)**	**Accidents/km/year**	**Total**
	1	1	0570	MT LEHMAN - PEARDONVILLE U/P	2.22	0.901	20
	2	3/6	1360	SALMO - BURNT FLAT	14.31	0.419	60
	3	3A	1356	OOTISCHENIA (CASTLEGAR) - S SLOCAN	19.66	0.407	80

	4	1	0950	SALMON ARM - SICAMOUS	27.19	0.331	90
	5	19	2395	BEAVER COVE - BEAR COVE	48.56	0.329	160
	6	3	1395	ELKO - ALBERTA	80.45	0.323	260
	7	1	0905	JCT OLD RTE 3 (HOPE) - RTE 12 (LYTTON)	108.54	0.313	340
	8	22	1340	TRAIL - CASTLEGAR	26.48	0.302	80
	9	5A	1710	RTE 97C/5A ASPEN GROVE TO COLDWATER I/C	23.65	0.296	70
	10	16	1580	DOME CREEK - TETE JAUNE	146.27	0.273	399
SHEEP	**Rank**	**Highway**	**LKI Segment**	**Description**	**Length (km)**	**Accidents/km/year**	**Total**
	1	1	0915	SPENCES BRIDGE - JCTN RTE 97C (N ASHCROFT ACCESS LOOP)	44.34	0.090	40
	2	97	1110	OSOYOOS - KALEDEN JCT	47.09	0.019	9
	3	3	1395	ELKO - ALBERTA	80.45	0.016	13
	4	3	1365	BURNT FLAT - CRESTON	66.70	0.015	10
	5	97	1115	KALEDEN (JCT 3A) - DROUGHT HILL I/C (JCT RTE 97C)	57.61	0.007	4
	6	1	0985	GLACIER PARK - GOLDEN	56.06	0.005	3
	7	3	1320	KEREMEOS - OSOYOOS	46.16	0.004	2
	8	31	1367	BALFOUR - LARDEAU	75.59	0.004	3
	9	93/95	2140	WASA - RADIUM	102.51	0.004	4
	10	3	1310	PRINCETON - KEREMEOS	67.31	0.003	2
COYOTE	**Rank**	**Highway**	**LKI Segment**	**Description**	**Length (km)**	**Accidents/km/year**	**Total**
	1	1	0570	MT LEHMAN - PEARDONVILLE U/P	2.22	1.892	42
	2	10	3120	GLOVER RD - SPRINGBROOK RD	3.61	0.111	4
	3	1	0920	CACHE CREEK - JCT RTE 5 (AFTON) KAMLOOPS	71.99	0.082	59
	4	5A	1710	RTE 97C/5A ASPEN GROVE TO COLDWATER I/C	23.65	0.063	15
	5	1	0575	BRIDAL FALLS - RTE 11	43.51	0.053	23
	6	11	2744	S JCTN BYPASS (RTE 1A)/RTE 11 - RTE 7 (MISSION)	9.99	0.050	5
	7	97	1115	KALEDEN (JCT 3A) - DROUGHT HILL I/C (JCT RTE 97C)	57.61	0.043	25
	8	1	0550	RTE 1: 264TH ST - MT LEHMAN	55.21	0.042	23
	9	7	2710	BURNABY - PORT COQUITLAM	21.13	0.033	7
	10	11	2742	HUNTINGDON CUSTOMS : RTE 1 (ABBOTSFORD)	3.37	0.030	1
PORCUPINE	**Rank**	**Highway**	**LKI Segment**	**Description**	**Length (km)**	**Accidents/km/year**	**Total**
	1	16	1505	PRINCE RUPERT - TERRACE	150.64	0.088	133
	2	1	0570	MT LEHMAN - PEARDONVILLE U/P	2.22	0.045	1
	3	37	3730	MEZIADIN LAKE JCT - NORTH BELL IRVING	93.53	0.045	42
	4	16	1520	HAZELTON - HOUSTON	131.69	0.043	56
	5	37	1514	KITIMAT - TERRACE	58.87	0.037	22
	6	37	3710	KITWANGA - CRANBERRY JCT	75.96	0.028	21
	7	16	1570	PRINCE GEORGE: RTE 97 ON BYPASS - BOEING RD	8.60	0.023	2
	8	16	1510	TERRACE - KITWANGA	90.73	0.021	19
	9	97	1160	PARSNIP RIVER - CHETWYND	149.26	0.019	29
	10	97	1155	PRINCE GEORGE - PARSNIP RIVER	155.93	0.019	29

Map 5

Total Deer Accidents (1991 - 2000)



Legend
- 2001 - 2500
- 1001 - 2000
- 501 - 1000
- 151 - 500
- 51 - 150
- 1 - 50
- No Accidents Reported by LKI Segment
- No WARS Data (Federally Maintained)
- MoT District Boundaries

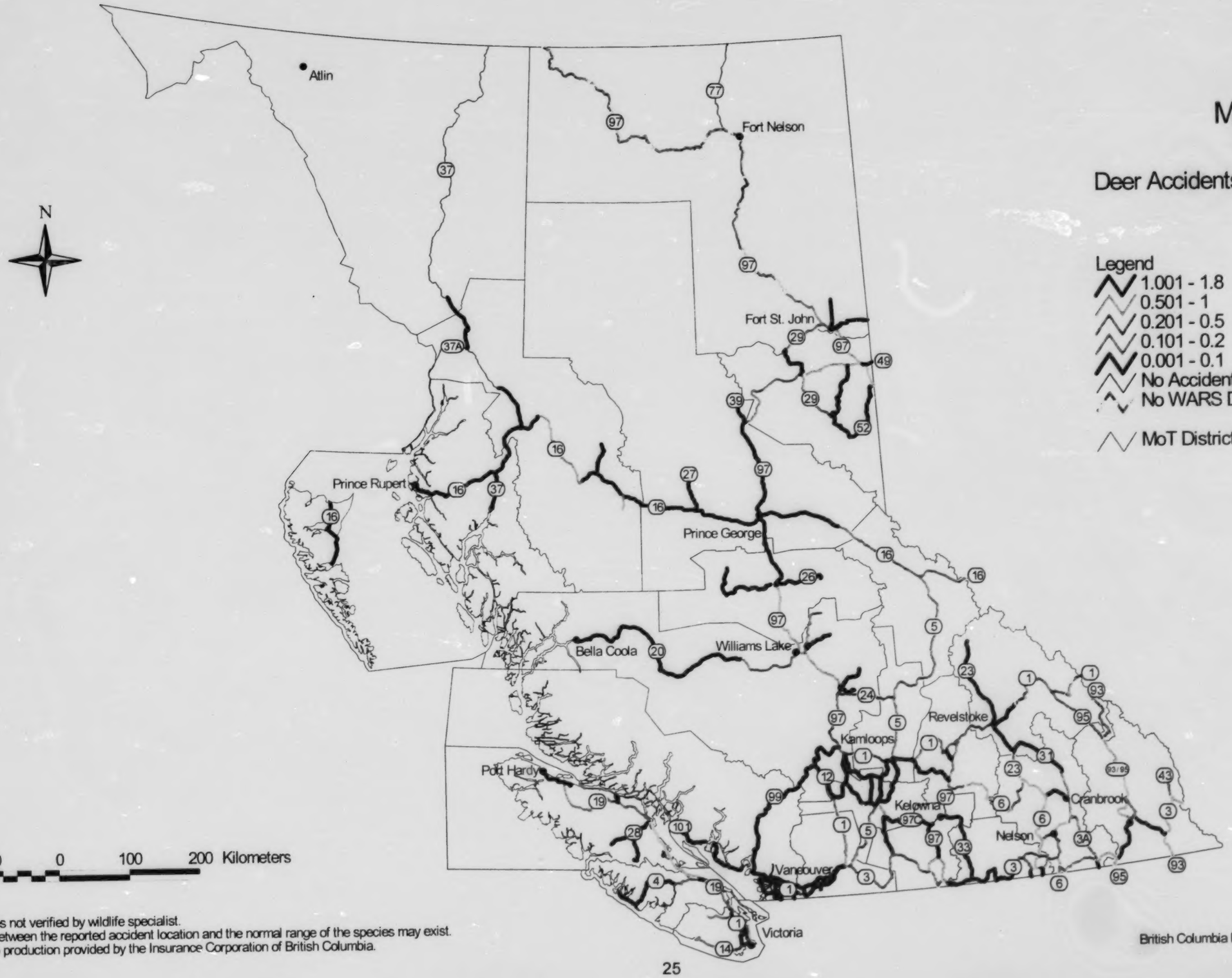
100 0 100 200 Kilometers

Notes:
(1) Reported species not verified by wildlife specialist.
(2) Discrepancies between the reported accident location and the normal range of the species may exist.
(3) Funding for map production provided by the Insurance Corporation of British Columbia.

British Columbia Ministry of Transportation, October 2001.

Map 6

Deer Accidents/km/year (1991 - 2000)



Legend
- 1.001 - 1.8
- 0.501 - 1
- 0.201 - 0.5
- 0.101 - 0.2
- 0.001 - 0.1
- No Accidents Reported by LKI Segment
- No WARS Data (Federally Maintained)
- MoT District Boundaries

Notes:
(1) Reported species not verified by wildlife specialist.
(2) Discrepancies between the reported accident location and the normal range of the species may exist.
(3) Funding for map production provided by the Insurance Corporation of British Columbia.

British Columbia Ministry of Transportation, October 2001.

Map 7

Total Moose Accidents (1991 - 2000)

Legend
- 151 - 250
- 101 - 150
- 51 - 100
- 21 - 50
- 1 - 20
- No Accidents Reported by LKI Segment
- No WARS Data (Federally Maintained)
- MoT District Boundaries

Notes:
(1) Reported species not verified by wildlife specialist.
(2) Discrepancies between the reported accident location and the normal range of the species may exist.
(3) Funding for map production provided by the Insurance Corporation of British Columbia.

British Columbia Ministry of Transportation, October 2001.

Map 8

Moose Accidents/km/year (1991 - 2000)

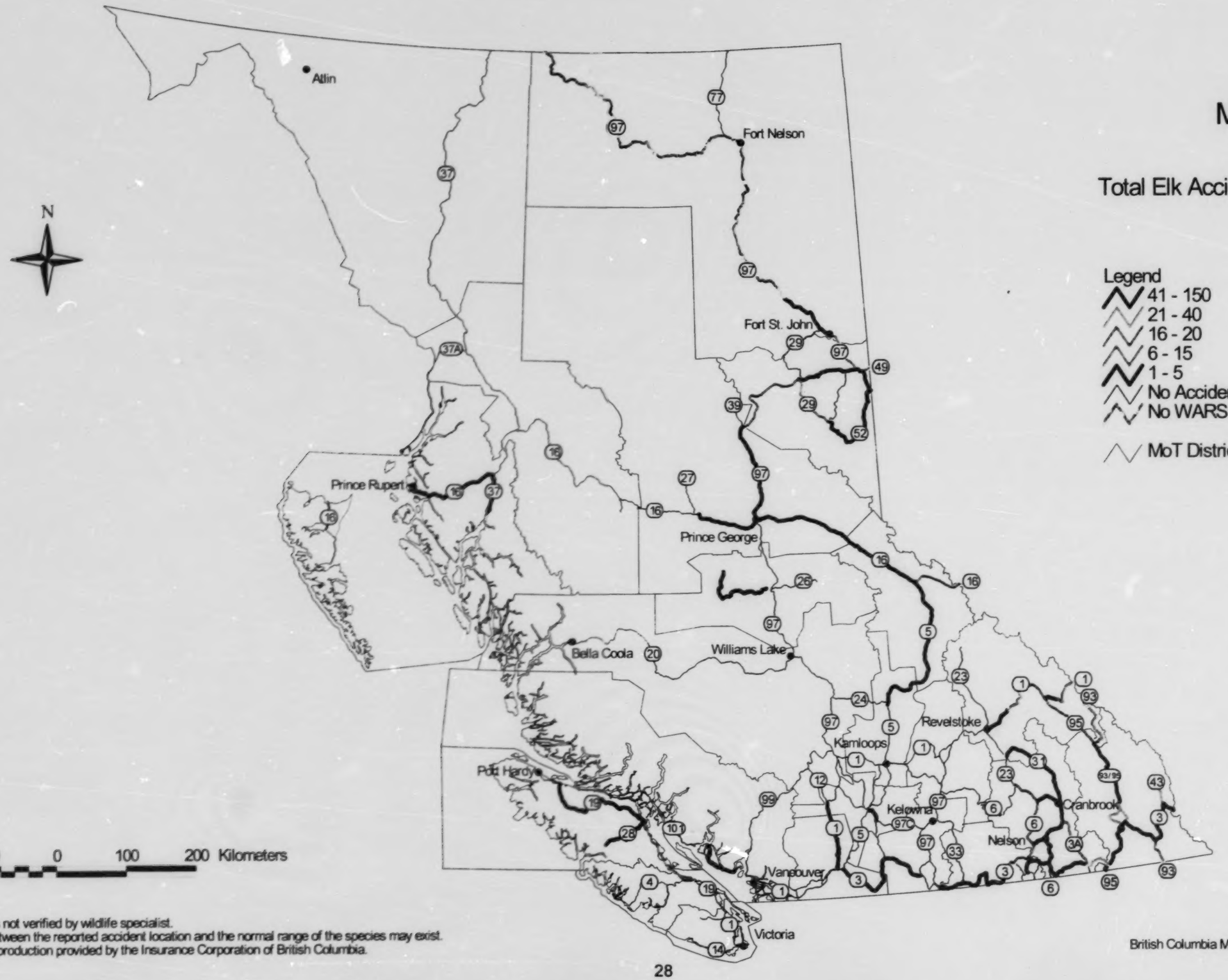
Legend
- 0.116 - 0.252
- 0.053 - 0.116
- 0.025 - 0.053
- 0.011 - 0.025
- 0.001 - 0.01
- No Accidents Reported by LKI Segment
- No WARS Data (Federally Maintained)
- MoT District Boundaries

Notes:
(1) Reported species not verified by wildlife specialist.
(2) Discrepancies between the reported accident location and the normal range of the species may exist.
(3) Funding for map production provided by the Insurance Corporation of British Columbia.

British Columbia Ministry of Transportation, October 2001.

Map 9

Total Elk Accidents (1991 - 2000)



Legend
- 41 - 150
- 21 - 40
- 16 - 20
- 6 - 15
- 1 - 5
- No Accidents Reported by LKI Segment
- No WARS Data (Federally Maintained)
- MoT District Boundaries

Notes:
(1) Reported species not verified by wildlife specialist.
(2) Discrepancies between the reported accident location and the normal range of the species may exist.
(3) Funding for map production provided by the Insurance Corporation of British Columbia.

British Columbia Ministry of Transportation, October 2001.

Map 10

Elk Accidents/km/year (1991 - 2000)

Legend
- 1.001 - 2
- 0.501 - 1
- 0.201 - 0.5
- 0.011 - 0.2
- 0.001 - 0.01
- No Accidents Reported by LKI Segment
- No WARS Data (Federally Maintained)
- MoT District Boundaries

Notes:
(1) Reported species not verified by wildlife specialist.
(2) Discrepancies between the reported accident location and the normal range of the species may exist.
(3) Funding for map production provided by the Insurance Corporation of British Columbia.

British Columbia Ministry of Transportation, October 2001.

Map 11

Total Bear Accidents (1991 - 2000)

Legend

- 25 - 40
- 17 - 25
- 11 - 16
- 6 - 10
- 1 - 5
- No Accidents Reported by LKI Segment
- No WARS Data (Federally Maintained)
- MoT District Boundaries

Notes:
(1) Reported species not verified by wildlife specialist.
(2) Discrepancies between the reported accident location and the normal range of the species may exist.
(3) Funding for map production provided by the Insurance Corporation of British Columbia.

British Columbia Ministry of Transportation, October 2001.

Map 12

Bear Accidents/km/year (1991 - 2000)

Legend
- 1.001 - 6
- 0.251 - 1
- 0.101 - 0.25
- 0.001 - 0.025
- 0.026 - 0.1
- No Accidents Reported by LKI Segment
- No WARS Data (Federally Maintained)
- MoT District Boundaries

Notes:
(1) Reported species not verified by wildlife specialist.
(2) Discrepancies between the reported accident location and the normal range of the species may exist.
(3) Funding for map production provided by the Insurance Corporation of British Columbia.

British Columbia Ministry of Transportation, October 2001.

Map 13

Total Coyote Accidents (1991 - 2000)

Legend
- 30 - 60
- 21 - 30
- 11 - 20
- 6 - 10
- 1 - 5
- No Accidents Reported by LKI Segment
- No WARS Data (Federally Maintained)
- MoT District Boundaries

Notes:
(1) Reported species not verified by wildlife specialist.
(2) Discrepancies between the reported accident location and the normal range of the species may exist.
(3) Funding for map production provided by the Insurance Corporation of British Columbia.

British Columbia Ministry of Transportation, October 2001.

Map 14

Coyote Accidents/km/year (1991 - 2000)

Legend
- No WARS Data (Federally Maintained)
- No Accidents Reported by LKI Segment
- 0.001 - 0.05
- 0.051 - 0.2
- 0.201 - 0.5
- 0.501 - 1
- 1.001 - 20
- MoT District Boundaries

Notes:
(1) Reported species not verified by wildlife specialist.
(2) Discrepancies between the reported accident location and the normal range of the species may exist.
(3) Funding for map production provided by the Insurance Corporation of British Columbia.

British Columbia Ministry of Transportation, September 2001.

Map 15

Total Sheep Accidents (1991 - 2000)

Legend
- 25 - 40
- 17 - 25
- 11 - 16
- 6 - 10
- 1 - 5
- No Accidents Reported by LKI Segment
- No WARS Data (Federally Maintained)
- MoT District Boundaries

Notes:
(1) Reported species not verified by wildlife specialist.
(2) Discrepancies between the reported accident location and the normal range of the species may exist.
(3) Funding for map production provided by the Insurance Corporation of British Columbia.

British Columbia Ministry of Transportation, October 2001.

Map 16

Sheep Accidents/km/year (1991 - 2000)

Legend
- 0.021 - 0.09
- 0.008 - 0.02
- 0.005 - 0.007
- 0.003 - 0.004
- 0.001 - 0.002
- No Accidents Reported by LKI
- No WARS Data (Federally Maintained)
- MoT District Boundaries

Notes:
(1) Reported species not verified by wildlife specialist.
(2) Discrepancies between the reported accident location and the normal range of the species may exist.
(3) Funding for map production provided by the Insurance Corporation of British Columbia.

British Columbia Ministry of Transportation, October 2001.

Map 17

Total Porcupine Accidents (1991 - 2000)

Legend
- 101 - 140
- 31 - 100
- 11 - 30
- 6 - 10
- 1 - 5
- No Accidents Reported by LKI Segment
- No WARS Data (Federally Maintained)
- MoT District Boundaries

Notes:
(1) Reported species not verified by wildlife specialist.
(2) Discrepancies between the reported accident location and the normal range of the species may exist.
(3) Funding for map production provided by the Insurance Corporation of British Columbia.

British Columbia Ministry of Transportation, October 2001.

Map 18

Porcupine Accidents/km/year (1991 - 2000)

Legend
- 0.051 - 0.1
- 0.026 - 0.05
- 0.011 - 0.025
- 0.006 - 0.01
- 0.001 - 0.005
- No Accidents Reported by LKI Segment
- No WARS Data (Federally Maintained)
- MoT District Boundaries

100 0 100 200 Kilometers

Notes:
(1) Reported species not verified by wildlife specialist.
(2) Discrepancies between the reported accident location and the normal range of the species may exist.
(3) Funding for map production provided by the Insurance Corporation of British Columbia.

British Columbia Ministry of Transportation, October 2001.

WILDLIFE SPECIES ACCIDENT SUMMARIES

Accident Rates by Species

In 2000, approximately 80% of the wildlife-vehicle accidents recorded on British Columbia numbered highways involved deer. Of the remaining reported accidents; moose were involved in over 6%, elk were involved in over 3%, bears were involved in 2%, coyotes were involved in over 2%, and all other wild animals, ranging from badgers to wolves, made up the remaining 7% (Table 9). The entire record for the 4,768 wild animals of known species reported for all regions and districts is listed in Table 10. Comparisons between 1991 and 2000 accidents are shown in Table 11.

Trends appear when the monthly distribution of wildlife-vehicle accidents for all species is compared for each Region (Table 12). When all records for the period between 1991 and 2000 are compared, the accident rate for all Regions peaks in May and November (Figure 3). Since deer represent approximately 80% of the wildlife killed on provincial highways, the general trend parallels the trend found for deer. The high numbers of deer killed obscures the trends for other species (Figure 4).

Table 9. Wildlife Accidents by Species (2000)

Species	Number	%
badger	2	0.04
bear	101	2.12
beaver	19	0.40
bobcat	4	0.08
caribou	3	0.06
cougar	2	0.04
coyote	105	2.20
deer	3,836	80.45
eagle	1	0.02
elk	167	3.50
fox	14	0.29
horned owl	2	0.04
lynx	1	0.02
moose	323	6.77
muskrat	3	0.06
otter	2	0.04
porcupine	40	0.84
rabbit	6	0.13
raccoon	51	1.07
sheep	15	0.31
skunk	10	0.21
other	61	1.28
Total	**4768**	**100.00**

Table 10. Wildlife Accidents by Province, Region and District by Known Species (2000)

A) Provincial Distribution

		all species	badger	bear	beaver	bobcat	caribou	cougar	coyote	deer	eagle	elk	fox	horned owl	lynx	moose	muskrat	otter	porcupine	rabbit	raccoon	sheep	skunk	wolf
Totals		4707	3	100	19	4	3	4	103	3836	1	167	14	2	1	323	9	2	34	6	51	15	10	0

B) Regional Distribution

Region		all species	badger	bear	beaver	bobcat	caribou	cougar	coyote	deer	eagle	elk	fox	horned owl	lynx	moose	muskrat	otter	porcupine	rabbit	raccoon	sheep	skunk	wolf
1		255	0	10	3	0	0	0	39	183	0	0	0	0	0	2	1	1	0	0	15	0	1	0
2		909	1	28	4	4	0	0	26	789	0	3	5	0	0	27	0	0	3	0	3	12	4	0
3		1453	1	15	1	0	0	1	13	1252	1	130	0	1	0	21	2	0	1	2	4	3	5	0
4		916	1	15	1	0	0	2	19	625	0	18	5	0	1	227	0	0	1	1	0	0	0	0
5		197	0	26	4	0	3	0	5	72	0	0	4	1	0	46	6	0	29	0	1	0	0	0
6		977	0	6	6	0	0	1	1	915	0	16	0	0	0	0	0	1	0	3	28	0	0	0

C) District Distribution

Region	District	all species	badger	bear	beaver	bobcat	caribou	cougar	coyote	deer	eagle	elk	fox	horned owl	lynx	moose	muskrat	otter	porcupine	rabbit	raccoon	sheep	skunk	wolf
1	4	127	0	4	0	0	0	0	5	106	0	0	0	0	0	0	1	1	0	0	9	0	1	0
1	6	38	0	0	1	0	0	0	17	14	0	0	0	0	0	0	0	0	0	0	6	0	0	0
1	7	90	0	6	2	0	0	0	17	63	0	0	0	0	0	2	0	0	0	0	0	0	0	0
2	8	294	0	3	1	0	0	0	7	271	0	3	0	0	0	0	0	0	1	0	0	7	1	0
2	13	191	0	6	2	0	0	0	3	172	0	0	0	0	0	5	0	0	1	0	1	0	1	0
2	14	84	1	7	0	1	0	0	6	60	0	0	1	0	0	5	0	0	1	0	2	0	0	0
2	15	116	0	8	1	0	0	0	5	98	0	0	0	0	0	1	0	0	0	0	0	3	0	0
2	17	224	0	4	0	3	0	0	5	188	0	0	4	0	0	16	0	0	0	0	0	2	2	0
3	9	533	0	1	0	0	0	1	2	520	1	1	0	0	0	1	0	0	1	0	3	0	2	0
3	10	214	0	5	0	0	0	0	5	189	0	11	0	0	0	3	0	0	0	0	1	0	0	0
3	11	639	1	4	1	0	0	0	2	491	0	115	0	1	0	14	2	0	0	2	0	3	3	0
3	12	67	0	5	0	0	0	0	4	52	0	3	0	0	0	3	0	0	0	0	0	0	0	0
4	18	138	1	0	0	0	0	2	0	112	0	0	0	0	1	22	0	0	0	0	0	0	0	0
4	19	56	0	4	0	0	0	0	1	19	0	1	3	0	0	28	0	0	0	0	0	0	0	0
4	20	166	0	8	1	0	0	0	6	87	0	2	1	0	0	60	0	0	0	1	0	0	0	0
4	21	478	0	3	0	0	0	0	9	346	0	14	0	0	0	105	0	0	1	0	0	0	0	0
4	22	78	0	0	0	0	0	0	3	61	0	1	1	0	0	12	0	0	0	0	0	0	0	0
5	25	113	0	20	1	0	0	0	4	48	0	0	2	0	0	32	6	0	0	0	0	0	0	0
5	26	44	0	2	3	0	0	0	0	17	0	0	0	0	0	1	0	0	20	0	1	0	0	0
5	28	40	0	4	0	0	3	0	1	7	0	0	2	1	0	13	0	0	9	0	0	0	0	0
6	1	307	0	1	2	0	0	1	1	293	0	1	0	0	0	0	0	0	0	1	7	0	0	0
6	2	266	0	1	0	0	0	0	0	257	0	2	0	0	0	0	0	1	0	0	5	0	0	0
6	3	404	0	4	4	0	0	0	0	365	0	13	0	0	0	0	0	0	0	2	16	0	0	0

Table 11. Total Annual Number of Animals Killed by Known Species (1991 to 2000)

Year	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	Totals
all species	**3,305**	**3,174**	**4,798**	**5,335**	**4,764**	**3,853**	**3,650**	**4,559**	**4,845**	**4,707**	**42,990**
badger	0	0	0	1	0	0	0	1	2	2	**6**
bear	56	71	112	109	108	104	88	139	166	101	**1,054**
beaver	4	4	11	9	13	7	13	9	9	19	**98**
bobcat	7	6	7	1	5	5	0	1	2	4	**38**
buffalo	0	0	1	0	0	0	0	0	0	0	**1**
caribou	6	8	0	0	9	4	2	3	0	3	**35**
cougar	0	1	2	7	1	3	2	0	4	2	**22**
coyote	48	119	165	134	129	97	90	134	89	105	**1,110**
deer	2,745	2,585	3,992	4,375	3,917	3,148	3,017	3,683	3,896	3,836	**35,194**
eagle	0	0	1	0	0	0	0	1	1	1	**4**
elk	59	63	75	120	93	104	77	103	127	167	**988**
fox	8	0	4	5	3	5	6	5	12	14	**62**
horned owl	0	0	1	3	0	0	1	3	4	2	**14**
lynx	0	0	0	0	1	0	0	0	0	1	**2**
marmot	0	0	0	0	2	0	0	0	0	0	**2**
marten	0	0	0	0	3	1	0	0	0	0	**4**
moose	183	196	271	405	367	283	250	361	411	323	**3,050**
muskrat	0	0	1	2	0	1	2	1	1	3	**11**
otter	1	0	0	0	1	0	0	0	2	2	**6**
porcupine	174	108	123	103	76	33	67	61	59	40	**844**
possum	0	0	0	25	5	3	0	0	0	0	**33**
rabbit	0	0	0	0	3	0	4	2	2	6	**16**
raccoon	7	3	10	8	5	40	21	36	46	51	**227**
sheep	5	8	14	22	10	10	6	13	9	15	**112**
skunk	0	1	6	5	8	3	1	1	0	10	**35**
wolf	2	1	2	1	5	2	3	2	3	0	**21**

Table 12. Total Monthly Distribution of Wildlife Accidents by Known Species (1991 to 2000)

Species	January	February	March	April	May	June	July	August	September	October	November	December	Totals
all species	3,338	2,983	3,257	3,240	3,784	3,409	3,849	3,636	3,469	4,228	4,454	3,511	**43,158**
badger	0	0	0	0	1	0	2	0	1	0	1	0	**5**
bear	2	4	10	15	78	96	138	192	299	184	51	7	**1,076**
beaver	4	4	8	13	20	11	8	12	11	10	2	1	**104**
bobcat	13	4	1	4	4	0	3	2	2	2	2	1	**38**
caribou	5	1	1	0	5	2	1	1	4	6	11	5	**42**
cougar	1	1	4	1	2	2	2	0	0	1	5	1	**20**
coyote	105	99	64	59	58	47	79	123	165	140	88	91	**1,118**
deer	2,451	2,454	2,926	2,961	3,244	2,804	3,101	2,752	2,576	3,494	3,822	2,661	**35,246**
eagle	1	2	0	0	0	0	0	0	0	1	0	0	**4**
elk	150	83	79	0	75	76	55	53	41	65	104	144	**925**
fox	2	10	6	1	3	3	3	6	3	11	9	5	**62**
lynx	0	0	1	1	0	0	0	0	0	0	0	0	**2**
marmot	0	0	0	0	0	0	2	0	0	0	0	0	**2**
marten	0	0	0	2	0	2	0	0	0	0	0	0	**4**
moose	563	272	122	129	121	247	241	207	158	169	293	537	**3,059**
muskrat	2	3	3	2	0	0	1	0	0	0	0	0	**11**
otter	1	1	0	0	1	0	0	1	1	0	0	1	**6**
horned owl	0	0	0	2	0	0	0	5	1	1	1	1	**11**
porcupine	2	7	4	26	123	78	156	228	149	68	13	3	**857**
possum	2	1	1	1	11	6	3	1	0	4	1	2	**33**
rabbit	2	1	0	1	5	2	5	0	0	0	0	2	**18**
raccoon	10	10	6	3	21	16	20	25	28	48	26	19	**232**
sheep	14	16	10	7	2	9	6	7	9	5	12	15	**112**
skunk	0	1	1	3	1	5	6	5	9	3	0	1	**35**
wolf	0	3	2	2	0	1	1	0	2	3	2	5	**21**
other	8	6	8	7	9	2	16	16	10	13	11	9	**115**

Figure 3. Total Monthly Wildlife Accidents by Species
(1991 - 2000)

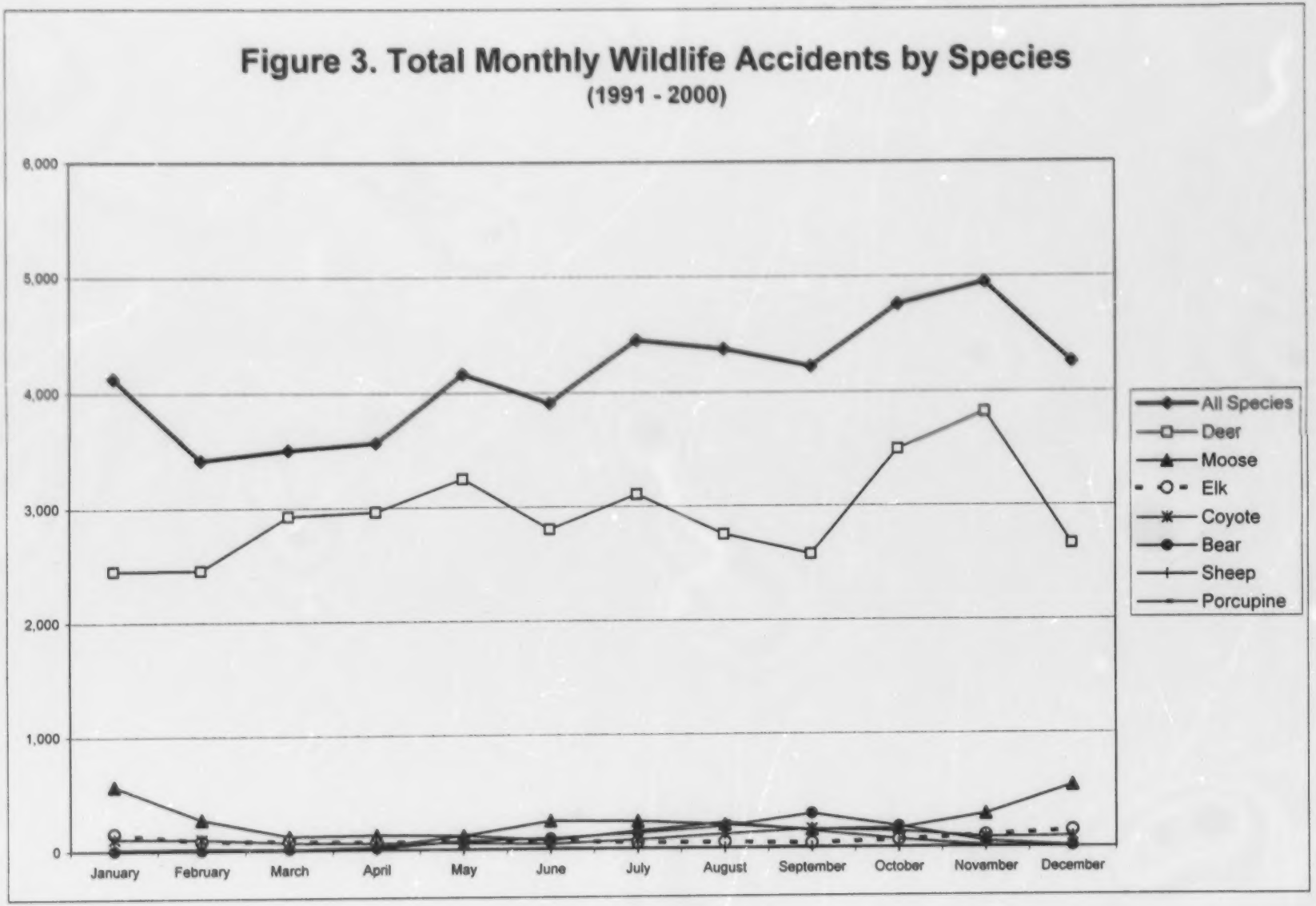
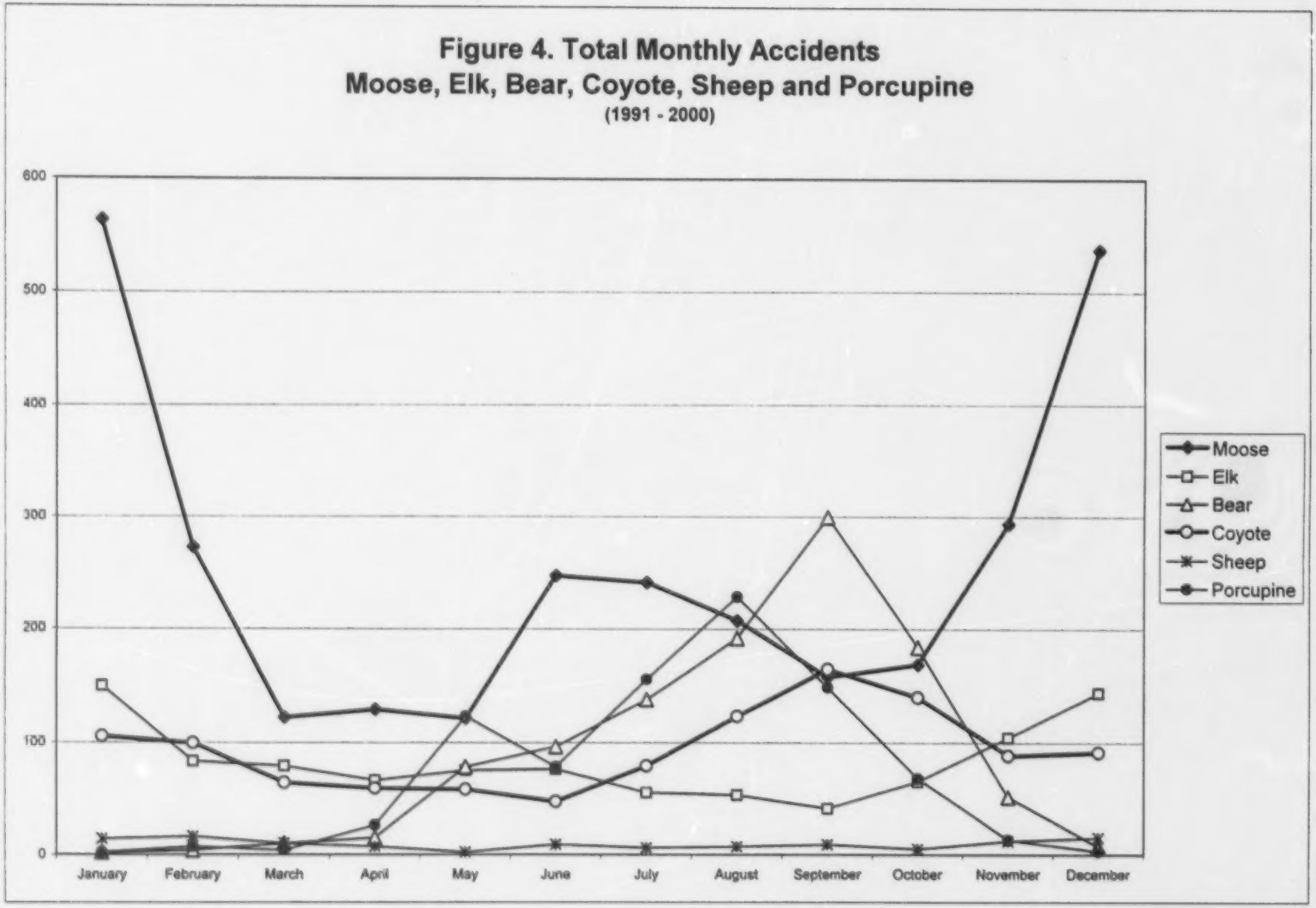


Figure 4. Total Monthly Accidents
Moose, Elk, Bear, Coyote, Sheep and Porcupine
(1991 - 2000)



When the accident patterns for deer, moose, elk, bear, coyote, sheep, and porcupine are examined, it is apparent the monthly accident distributions vary by species.

When deer accidents are evaluated by season and sex, female deer are involved in most accidents and these occur between March and May, and between October and November (Figure 5). The majority of bucks are killed between May and July and in November. The fall peak for both does and bucks is most likely related to the rutting season. When deer accidents are evaluated by age, adult deer are involved in most accidents (Figure 6). Young deer are mostly killed between May and November. This may be related to natural reproduction and cohort survival rates and the fact adult deer vastly outnumber young deer at all times.

The majority of moose are killed between October and March (Figures 7 and 8). This coincides with times of high snowfall in Regions 2, 3 and 4, when moose are found alongside highways that are actively kept cleared of snow. An accident peak is also observed in June, this may be due to pregnant cows moving to calving grounds in the early summer or licking salt on or along the highway.

Lesser numbers of elk are reported. The pattern for elk-related motor vehicle accidents is less established, however a small peak occurs between October and March (Figures 9 and 10). Elk appear to be influenced by the same snow conditions which affect moose.

Bear-related motor vehicle accidents occur more frequently in September (Figures 11 and 12). This peak coincides with the end of summer and the depletion of the bears' natural food sources in more remote locations.[1] At this time, bears appear to migrate toward food sources located near human settlements. Consequently, the number of bear-motor vehicle accidents increases at the same time bear-human conflicts also increase. Although common belief suggests all bears hibernate uninterrupted during the winter months, WARS data shows a small number of bears are killed between November and March. Apparently, on warmer winter days, some larger male bears awake from hibernation and roam about.

Sheep accidents exhibit peaks in February, June and September, with the largest peak occurring in February (Figures 13 and 14). In late winter, as snow levels at higher elevations increase, sheep migrate to valley bottoms where highways are typically located.[2] In early summer, sheep begin moving out of the valleys, feeding near highways, on their way to higher elevations for lambing. In late summer, they begin moving back in preparation for the rutting season, which usually occurs in October or November.

Coyote accidents peak at about the same time bear accidents do (Figures 15 and 16). Coyotes may be following bears onto roads in order to benefit from the remains of the animals bears kill or the remains bears find on the road or in the road right-of-way.[1]

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[1] Austin, M., 1999, Personal Communication, Large Carnivore Specialist, British Columbia Ministry of Water, Land and Air Protection (MWLAP), Wildlife Branch, Research and Conservation Section, Victoria, British Columbia

[2] Ashworth, D., 2001, Personal Communication, Conservation Officer, British Columbia Ministry of Water, Land and Air Protection (MWLAP), Conservation Officer Service, Cranbrook, British Columbia

Porcupine accidents exhibit two peaks, the first, a small peak in May, followed by a large peak in August (Figures 17 and 18). Although porcupines are not the largest animals found on provincial highways, they constitute a safety hazard as their quills can puncture motor vehicle tires and increase the severity of an accident.[3]

[3] Zacharias, C., 1999, Personal Communication, Environmental Management Coordinator, British Columbia Ministry of Transportation (MoT), Engineering Branch, Environmental Management Section, Victoria, British Columbia

Figure 5. Total Monthly Deer Accidents by Sex
(1991 - 2000)

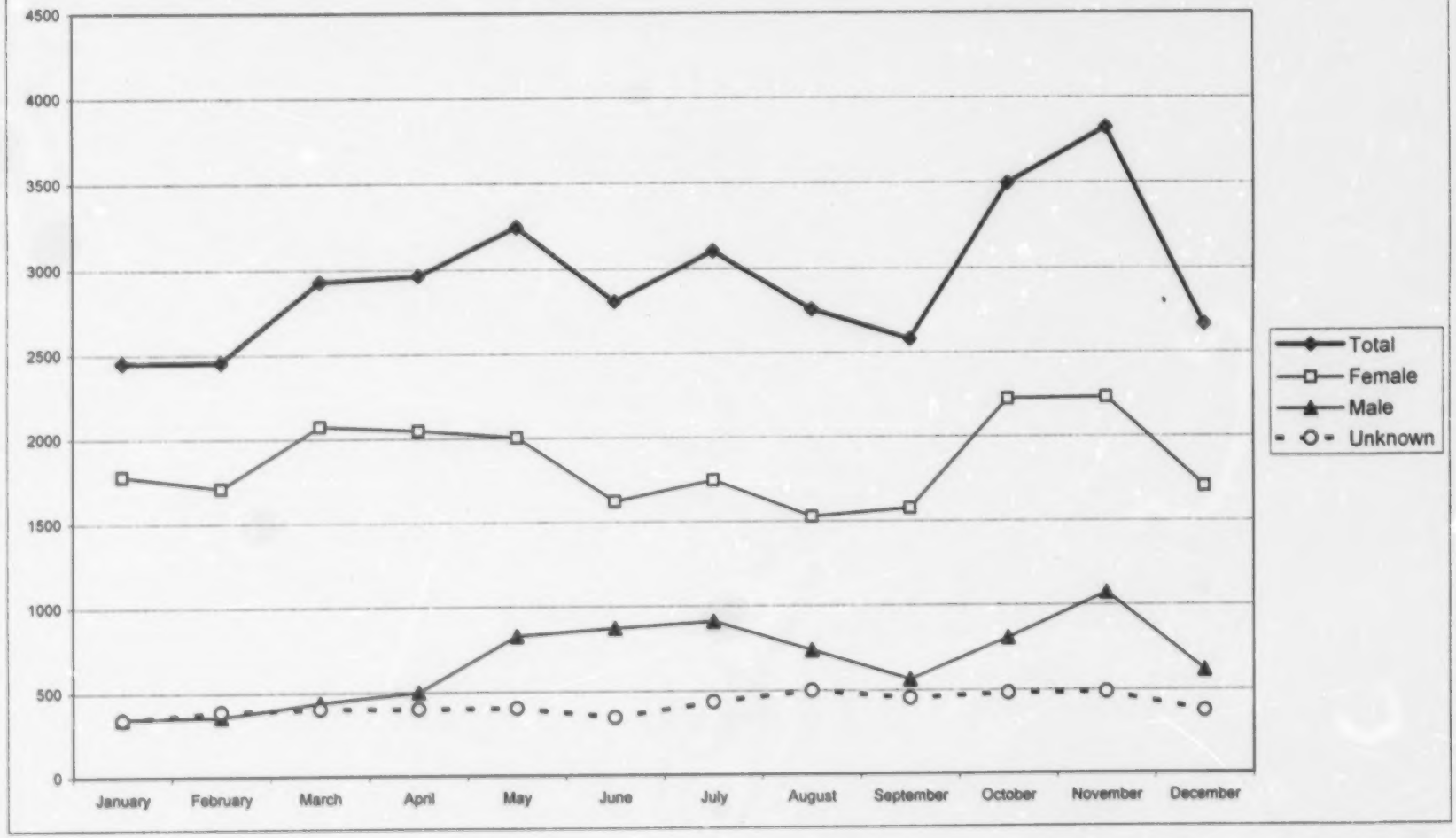


Figure 6. Total Monthly Deer Accidents by Age
(1991 - 2000)

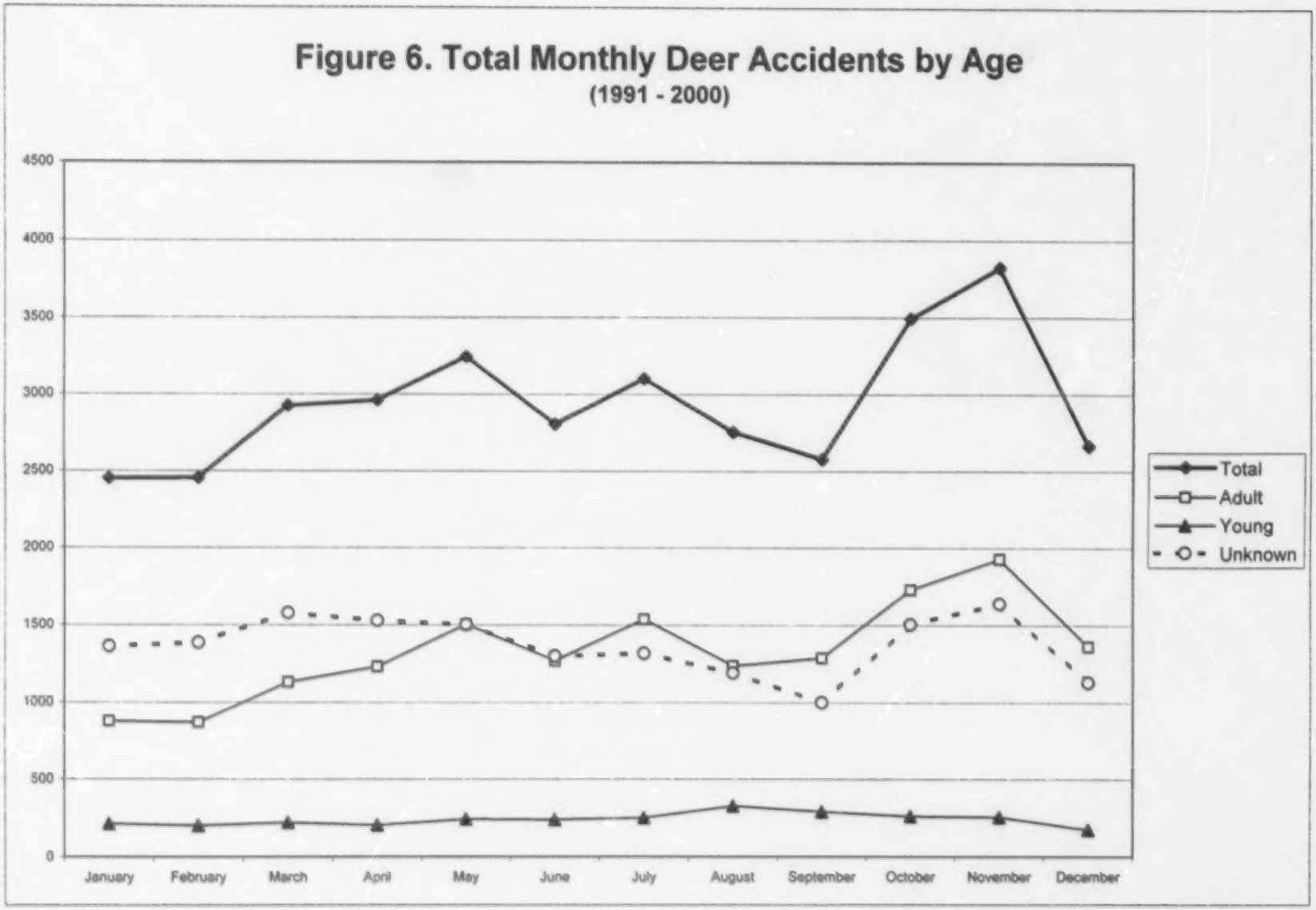


Figure 7. Total Monthly Moose Accidents by Sex
(1991 - 2000)

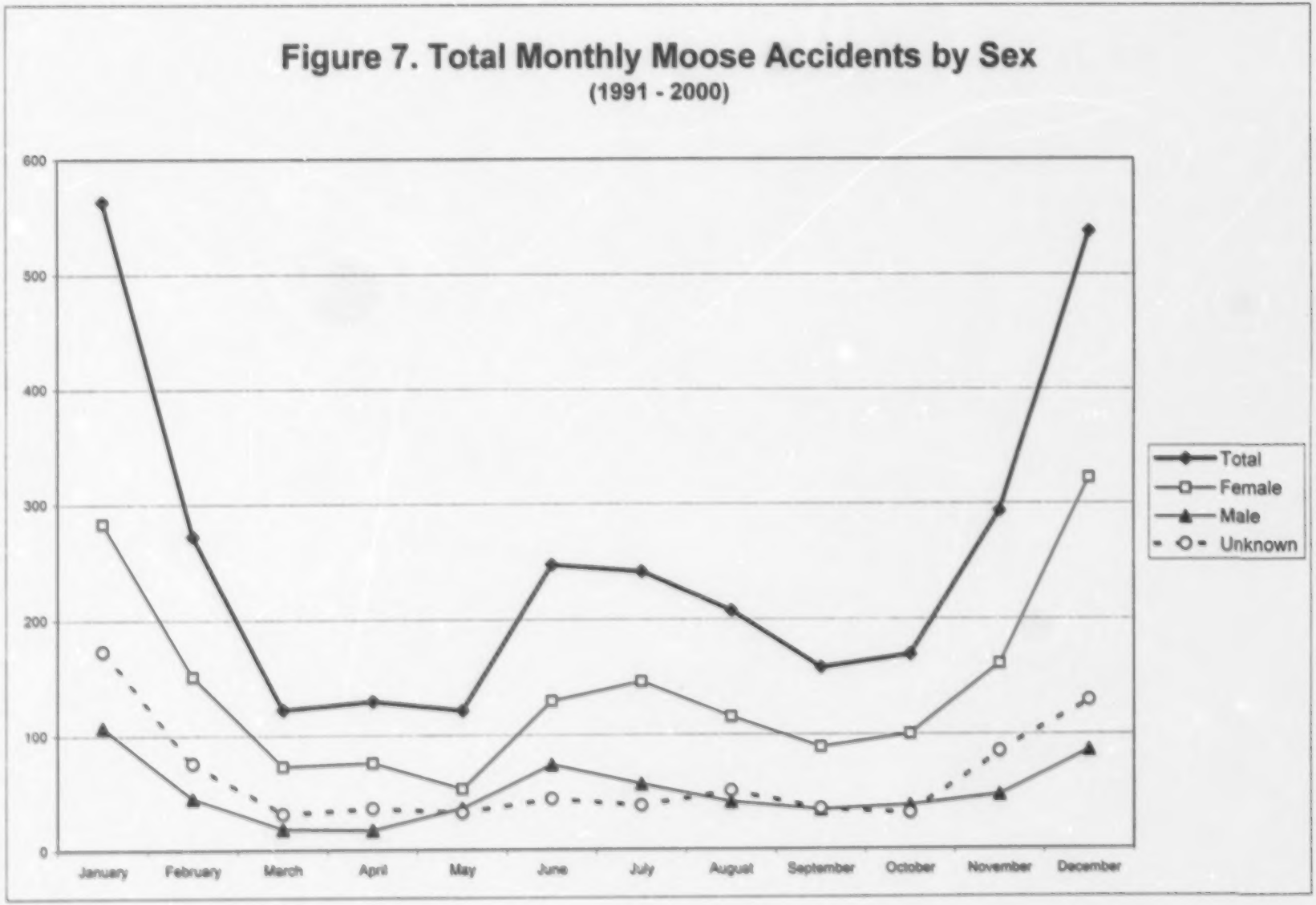


Figure 8. Total Monthly Moose Accidents by Age
(1991 - 2000)

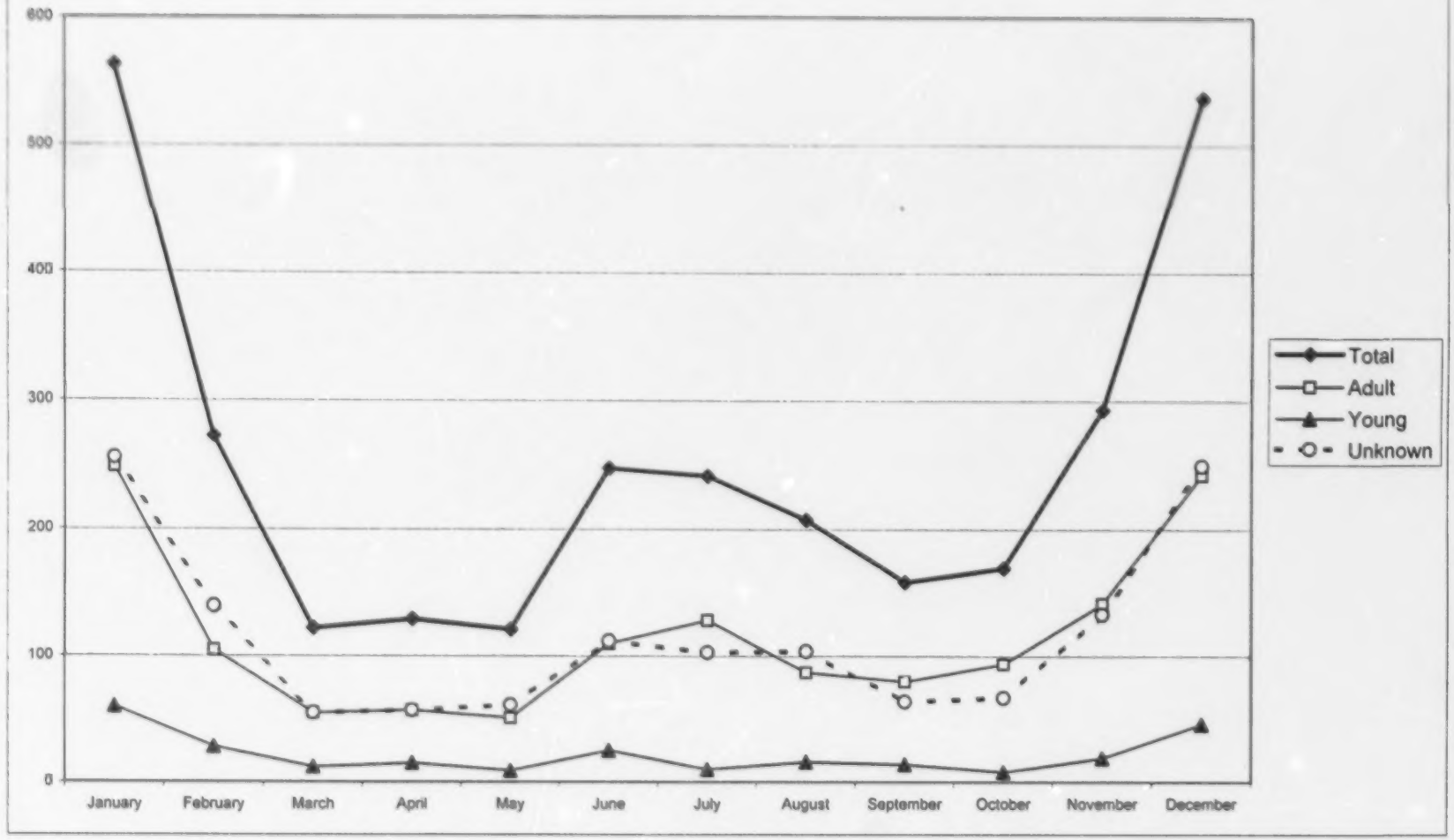


Figure 9. Total Monthly Elk Accidents by Sex
(1991 - 2000)

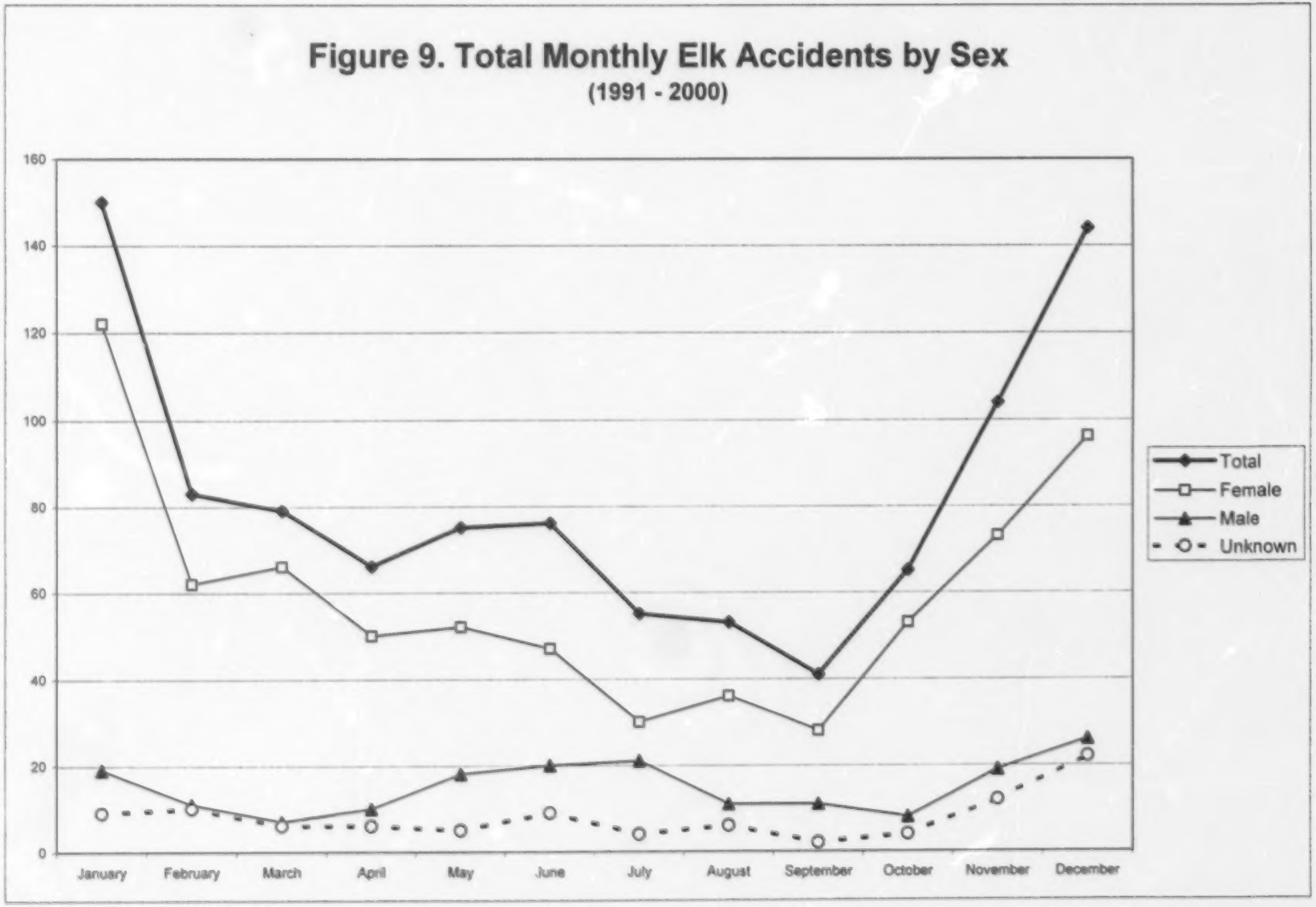


Figure 10. Total Monthly Elk Accidents by Age
(1991 - 2000)

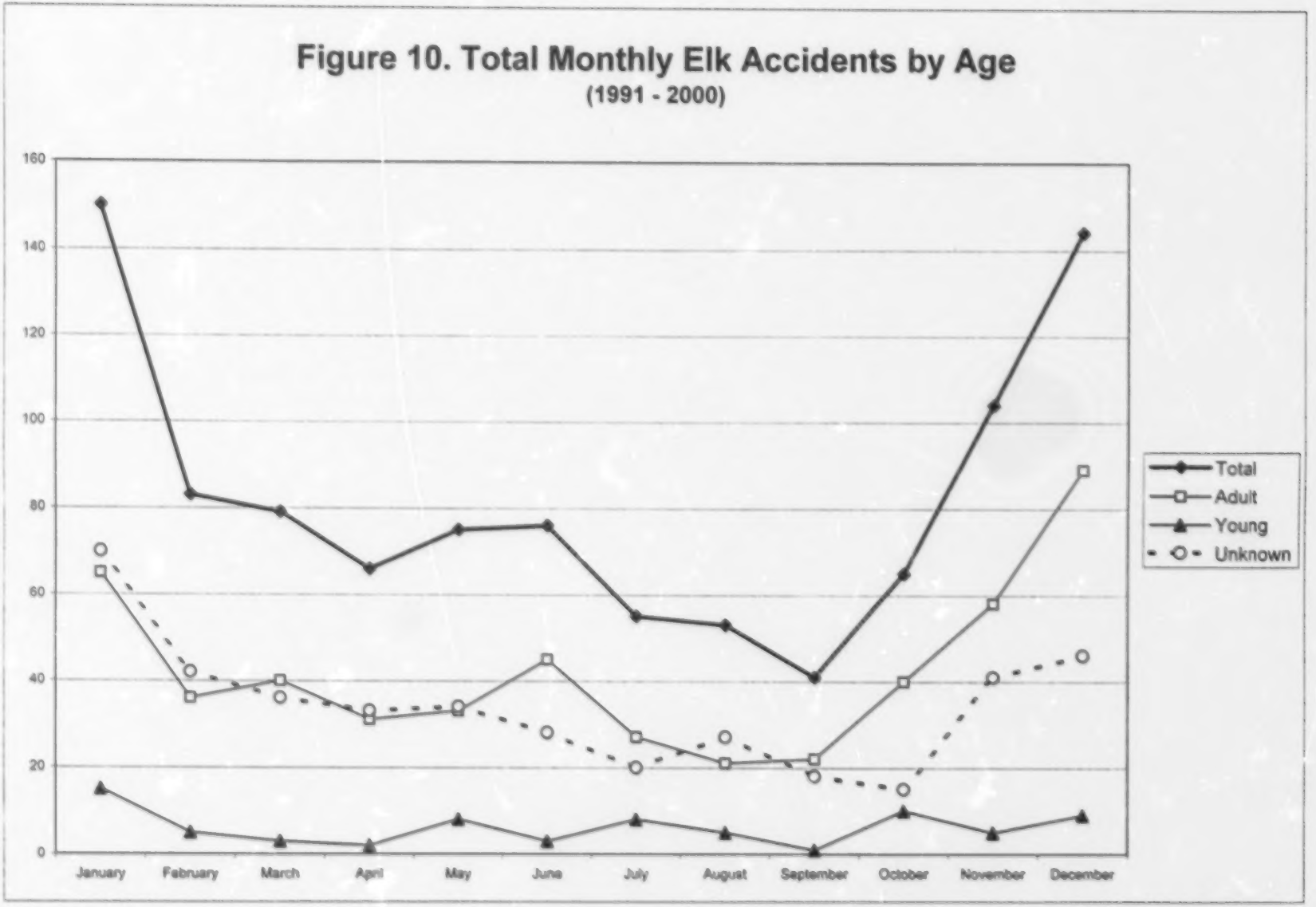


Figure 11. Total Monthly Bear Accidents by Sex
(1991 - 2000)

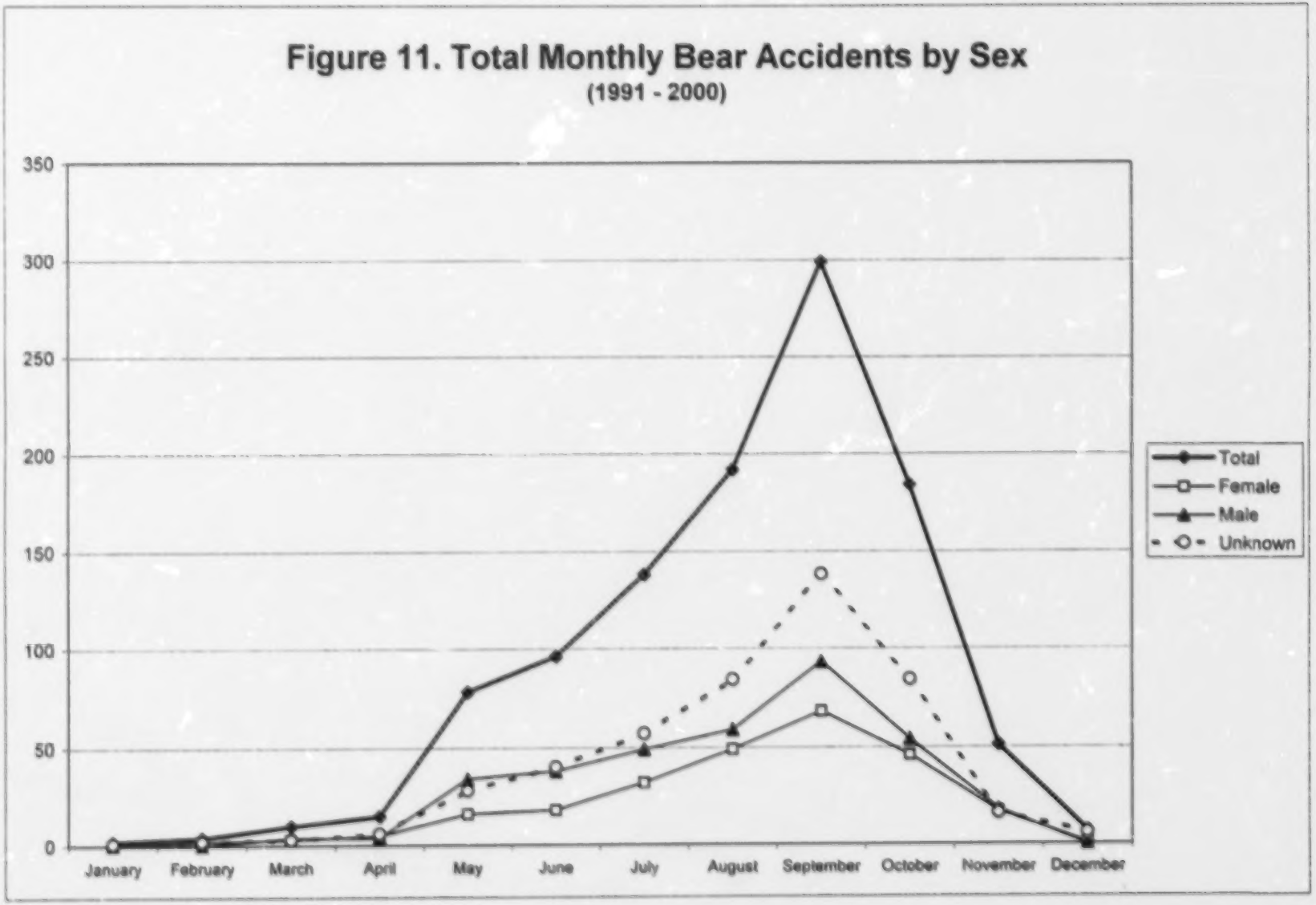


Figure 12. Total Monthly Bear Accidents by Sex
(1991 - 2000)

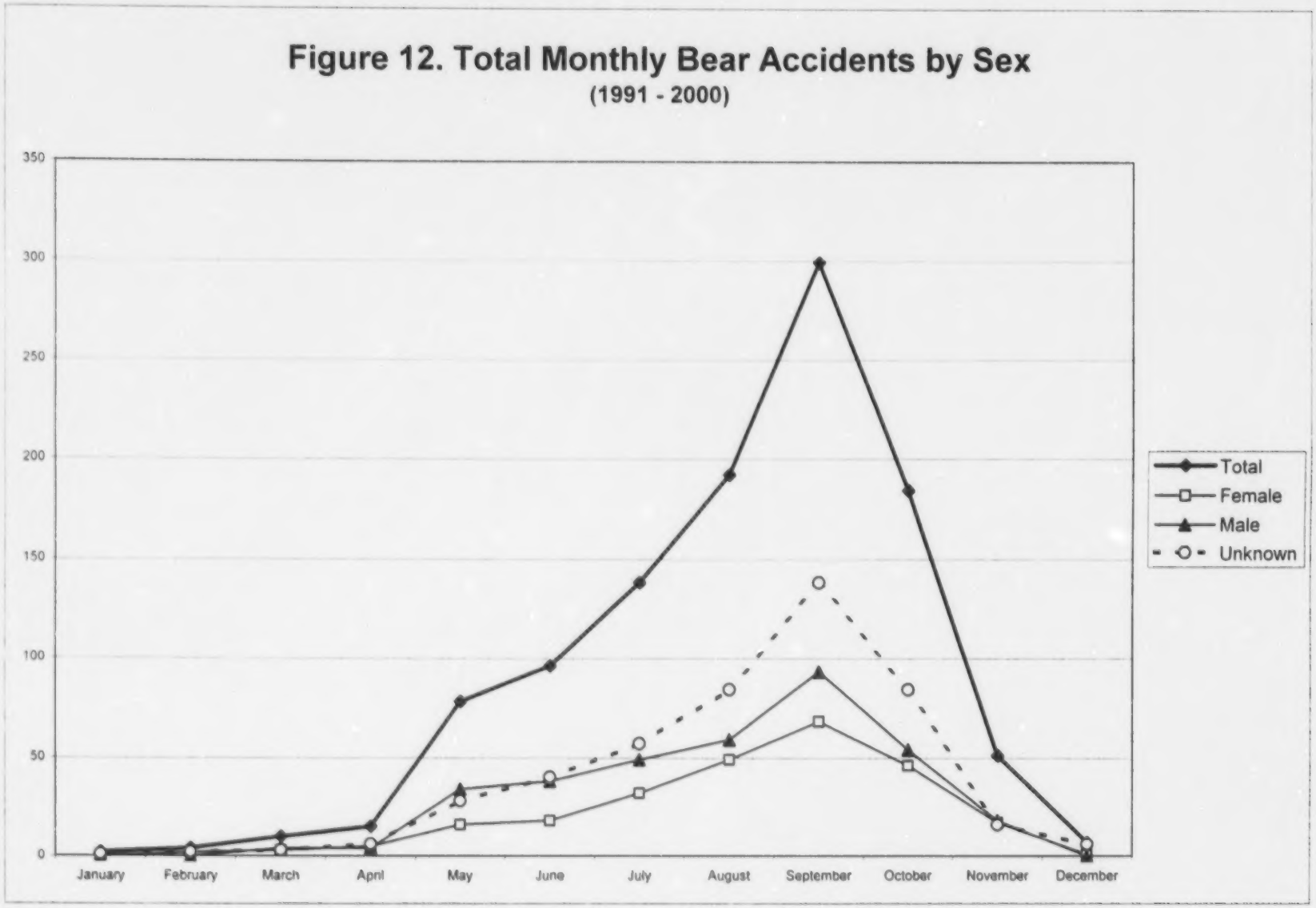


Figure 13. Total Monthly Coyote Accidents by Sex
(1991 - 2000)

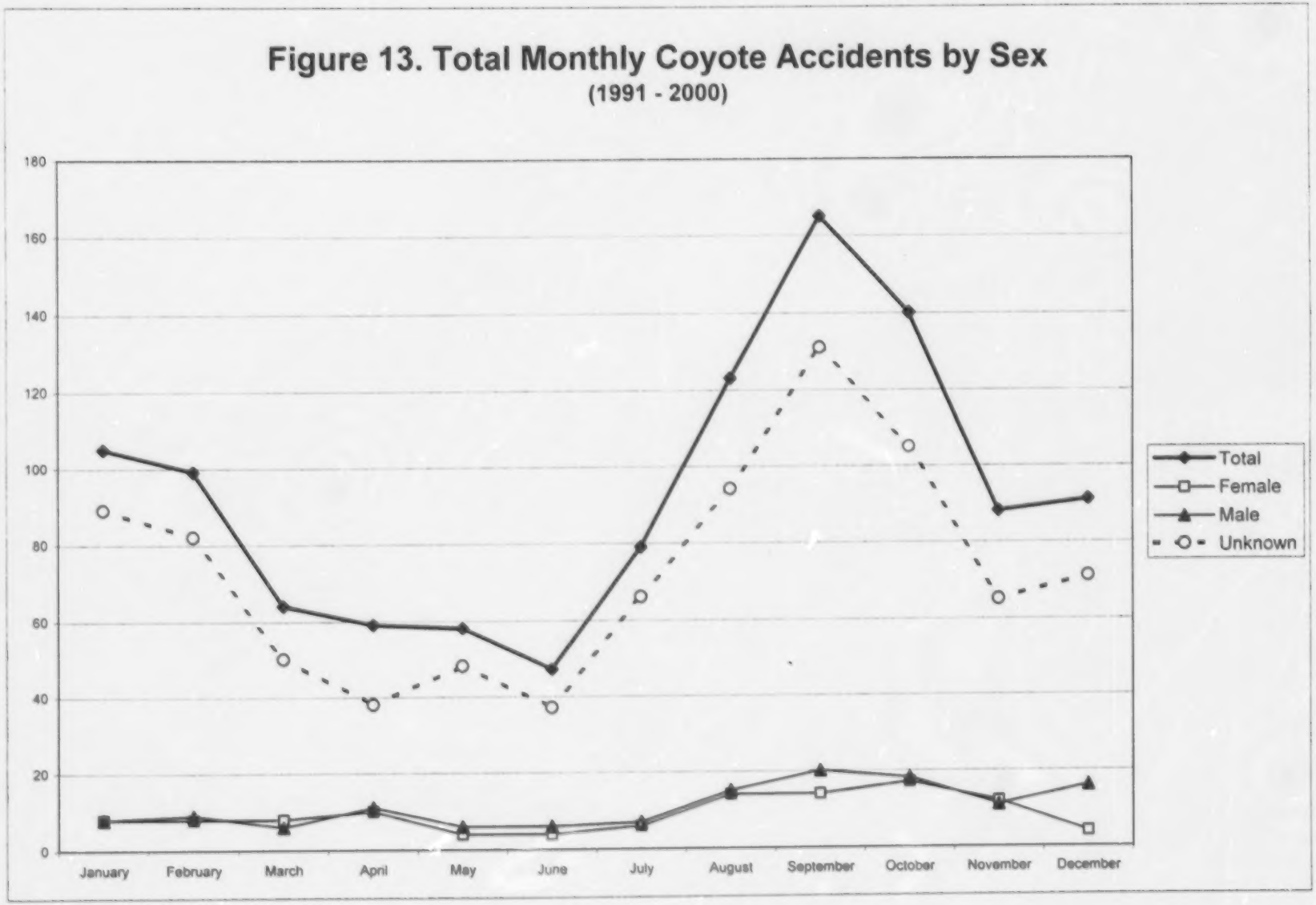


Figure 14. Total Monthly Coyote Accidents by Age
(1991 - 2000)

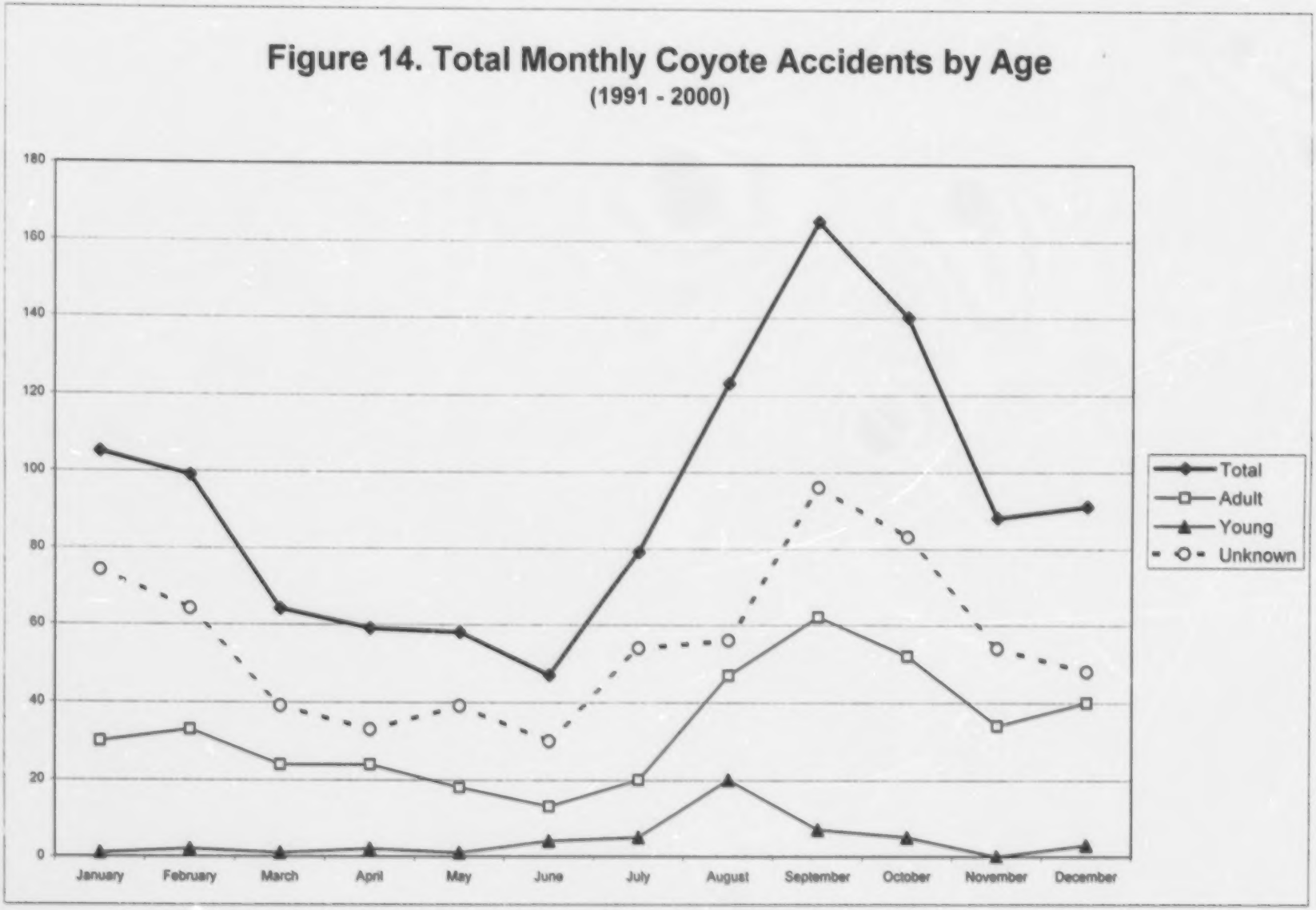


Figure 15. Total Monthly Sheep Accidents by Sex
(1991 - 2000)

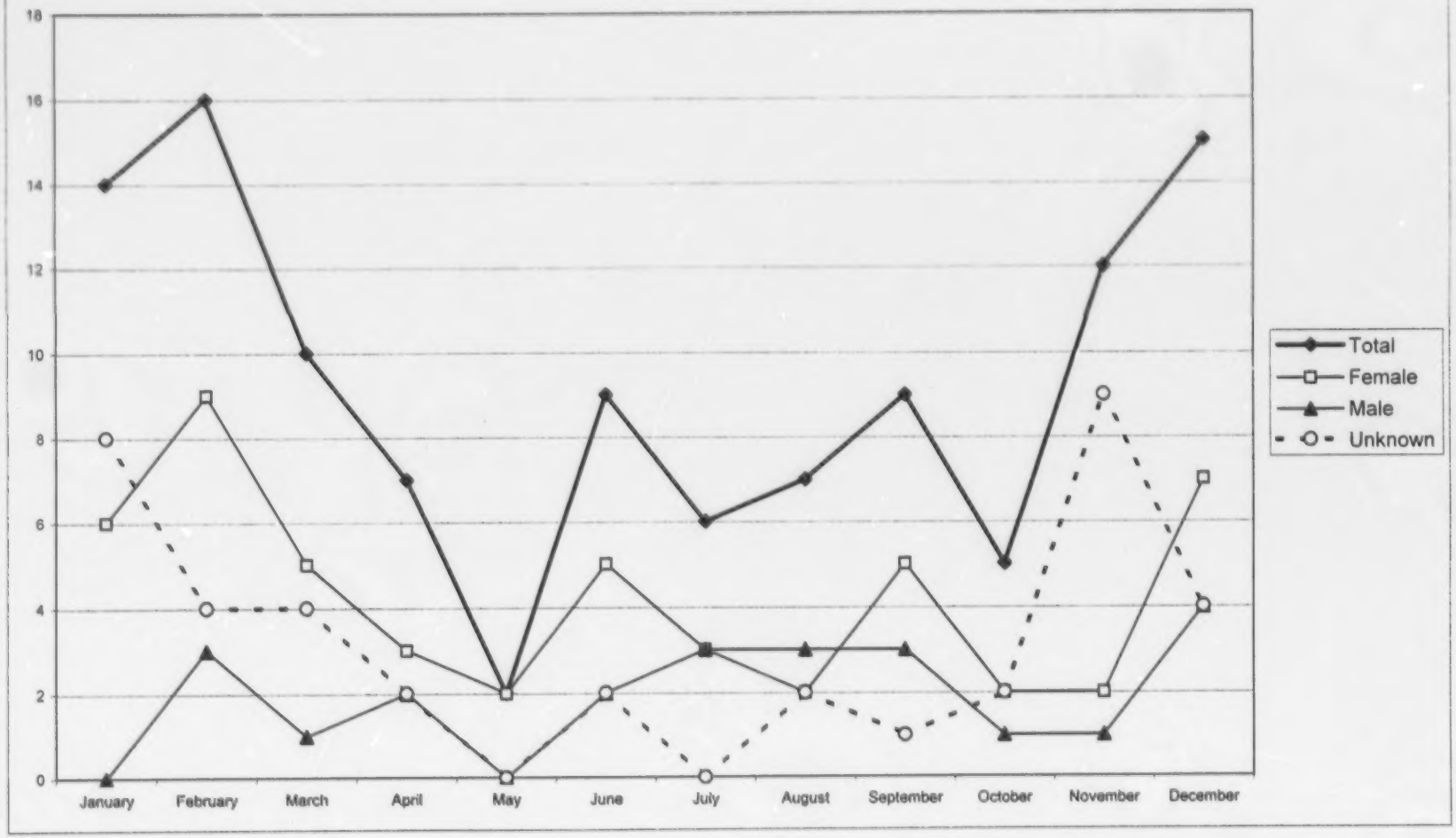


Figure 16. Total Monthly Sheep Accidents by Age
(1991 - 2000)

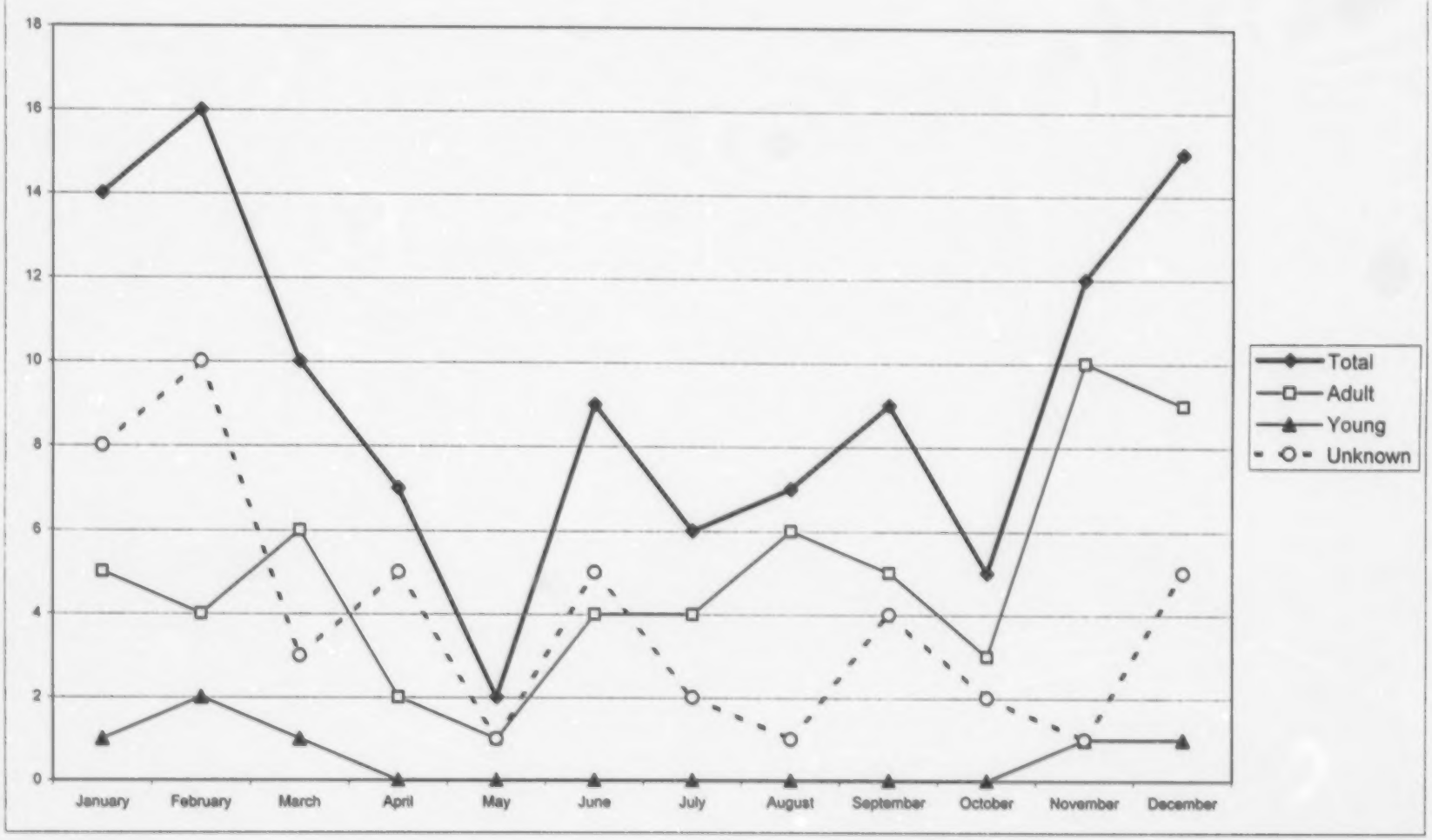


Figure 17. Total Monthly Porcupine Accidents by Sex
(1991 - 2000)

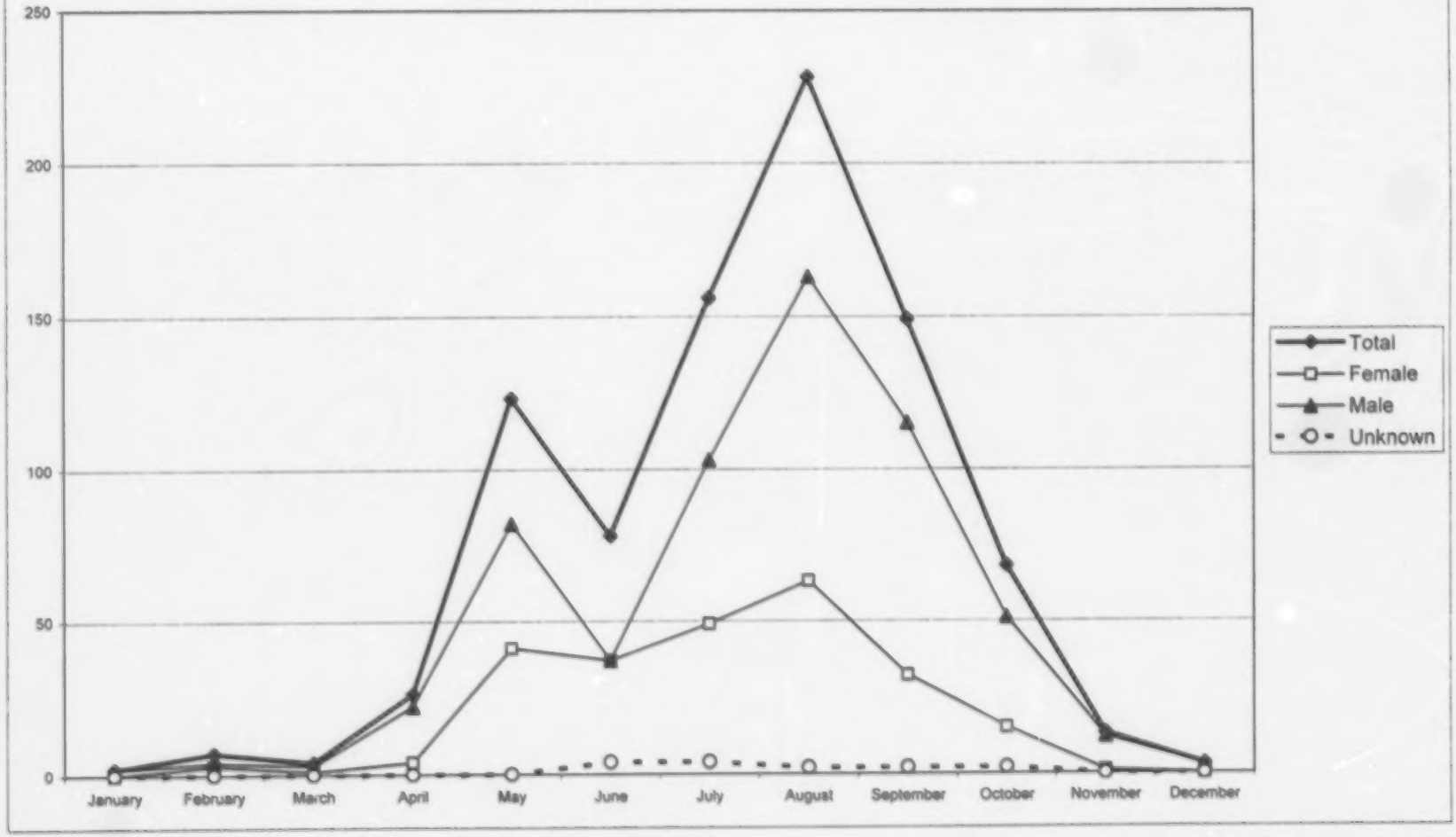
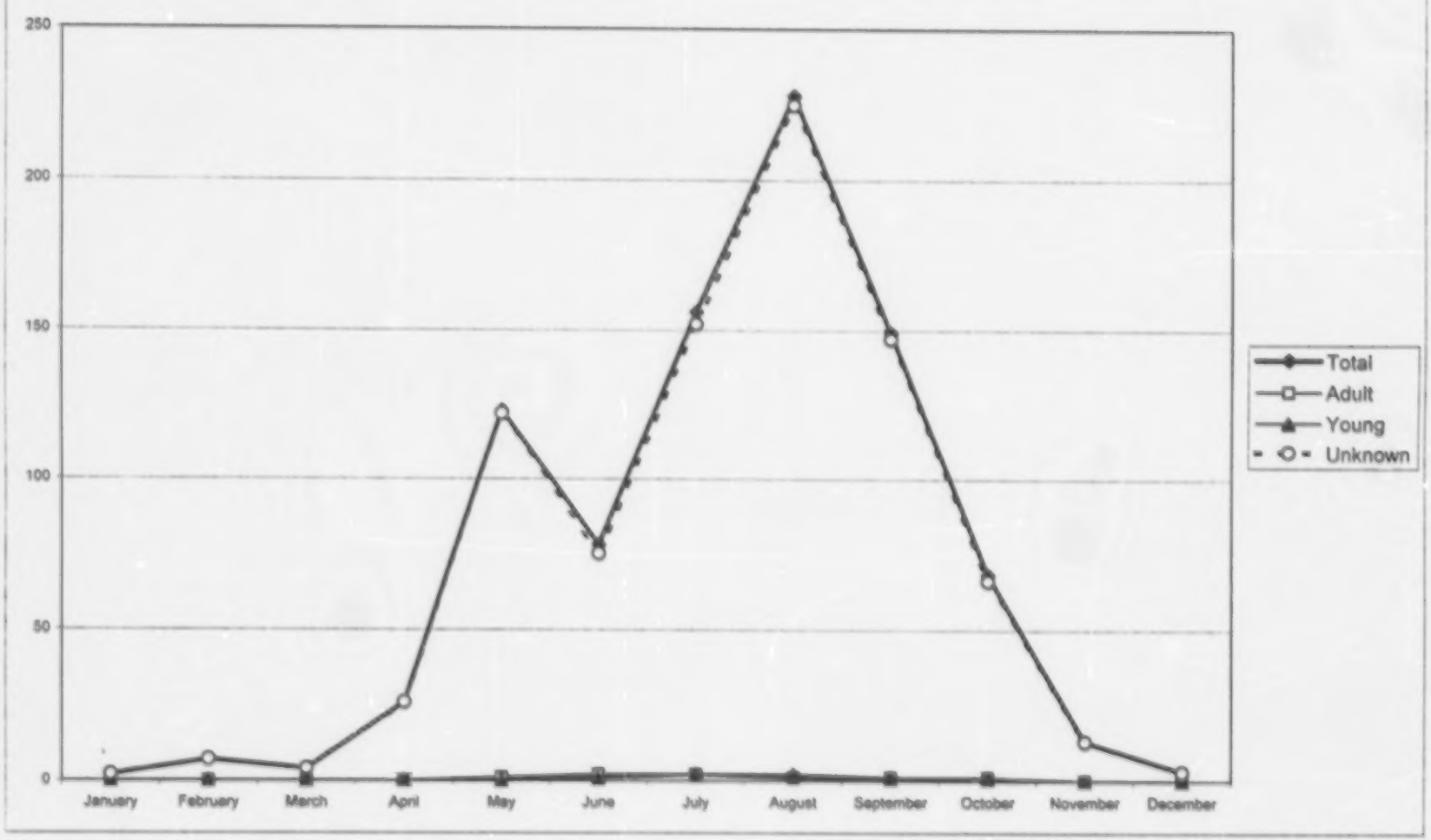


Figure 18. Total Monthly Porcupine Accidents by Age
(1991 - 2000)



WILDLIFE VEHICLE ACCIDENT MITIGATION METHODS

Overview

Methods utilized by the Ministry of Transportation to reduce wildlife vehicle accidents are pursued with multi-faceted objectives. The Ministry strives to reduce, and ultimately eliminate human and wildlife deaths and injuries, and motor vehicle and property damage; as well as increase public awareness and ensure mitigation techniques are cost effective. The mitigation methods currently employed by this Ministry include:

- habitat modification,
- exclusion fencing,
- wildlife warning signs, and
- wildlife warning reflectors.

Habitat Modification

Highways and right-of-ways are intrinsically attractive to wildlife. Highways are often located in areas where wildlife naturally congregate, especially during winter, such as valley bottoms and riversides. Also many ungulates prefer to travel along open areas close to cover, which represents the typical highway and right-of-way situation.

Historically, the Ministry used a variety of agricultural type seed blends to reseed right-of-way areas after road construction to prevent soil erosion. Although effective for their intended purpose, some seed blends, particularly those containing legumes such as clovers and alfalfa, appear to attract animals to the roadside.

In order to deter this, the Ministry has adjusted its seed mixes in problem areas to remove the plant types which are known to attract animals. The Ministry is also examining the potential of non-toxic, biodegradable systemic fertilizers and repellents which make roadside plants taste and smell less desirable to ungulates.

Exclusion Fencing

Exclusion fencing is the most effective means of keeping wildlife off highway right-of-ways. The Ministry's experience with 2.4 m high fencing on both sides of right-of-ways show it is 97-99% effective in preventing wildlife-vehicle accidents.

Fencing can be installed as a primary deterrent or in conjunction with other structures such as wildlife overpasses, underpasses and one way gates. This type of mitigation is expensive. It costs between $40,000 to $80,000 per km to fence both sides of a highway. Construction costs vary greatly due to differences in terrain and locations. Currently over 320 kilometres of fencing have been installed in Region Two on the Coquihalla Highway (Highway 5), the Okanagan Connector Freeway, and Highway 97 (Table 13).

Table 13. Locations of Wildlife Exclusion Fencing

Total Fencing Length on British Columbia Highways = 467.44 km

(This figure includes fencing located on both sides of highways)

Location: Coquihalla Highway (No. 5)	Distance (km)	Completion Date
Dry Gulch – Henning Bridge	5.99	July 1994
Henning Bridge – Juliet Creek	9.23	May 1993
Juliet Creek Bridge – Brodie Bridge	9.35	Oct 1993
Brodie Bridge – Kingsvale Bridge	8.72	March 1997
Upper Clapperton Creek – Desmond Lake	8.3	April 1990
Desmond Lake – Meadow Creek Road	8.6	July 1988
Meadow Creek Road – Chuwhels Mountain Road	8.2	Sept 1987
Chuwhels Mountain Overpass – Connolly Lake Overpass	5.2	June 1993
Connolly Lake Overpass – Inks Lake Interchange	7.6	May 1994
Total Fencing (includes both sides of highway)	**140.44 km**	

Location: Okanagan Connector Freeway (No. 97C)	Distance (km)	Completion Date
Aspen Grove to Drought Hill Interchange	82	Fall 1990
Total Fencing (includes both sides of highway)	**164 km**	

Location: Highway 97*	Distance (km)	Completion Date
Bentley Road to Deep Creek	15	March 1999
Total Fencing (one side of highway)	**15 km**	

Location: Inland Island Highway (No. 19)	Distance (km)	Completion Date
Mud Bay to Trent River (one side of highway)	20	March 1999
Millar Creek to Oyster River (both sides of highway)	23	April 2001
Maple Lake Pit to Headquarters Creek (both sides of highway)	26	August 2001
Oyster River to Willow Creek (both sides of highway)	15	May 2001
Total Fencing (includes both sides of highway)	**148 km**	

* Fencing materials provided by MoT; ICBC contributed $128,000, construction labour and on-going maintenance provided by members of the Summerland Sportsmens' Association and the Peachland Sportmens' Association, affiliated associations of the British Columbia Wildlife Federation.

The general locations of wildlife exclusion fence installations are shown on the Maintenance Contract Area maps (Appendix B). Wildlife exclusion fencing has proven very effective in reducing wildlife accidents on the Coquihalla Freeway (Highway 5) located between Hope and Merritt. On the 35 km portion of the Coquihalla Freeway, between Dry Gulch Bridge and Kingsvale Bridge, wildlife exclusion fencing reduced wildlife accidents by 100%. The number of wildlife accidents declined from 74, in the 1989 to 1993 period, to 0, in the 1994 to 1998 period.

Since the wildlife exclusion fencing was installed on the Coquihalla Connector Freeway (Highway 97C) in 1990 to 1998, no wildlife accidents have been recorded in either the westbound or eastbound lanes of the highway where the fence is located.

On Highway 97, between Peachland and Summerland, after a 21 kilometre wildlife exclusion fence was constructed on the west side of the highway, the rate of wild animal accidents/km/year dropped by over 93%. From 1979 to 1998 the annual accident rate was 1.93 accidents/km/year. In 1999, after the fence was completed, the accident rate dropped to 0.13 accidents/km/year.

The Mud Bay to Trent River section of wildlife exclusion fencing on the Inland Island Highway was constructed on the west side of the highway alignment. The single-sided fencing configuration was in accordance with the Vancouver Island Highway Project's wildlife consultants recommendation for dealing with Roosevelt Elk resident in the area.

Wildlife exclusion fencing has just been constructed between Oyster River and Willow Creek and between Millar Creek and Oyster River on both sides of the Inland Island Highway. Additional fencing is currently under construction on both sides of the Inland Island Highway between Maple Lake Pit and Headquarters Creek.

As part of its growing commitment to increase protection for other species of wildlife, MoT is currently installing amphibian exclusion fencing being attached to the wildlife exclusion fencing located adjacent to Millar Creek on the Inland Island Highway. The fence extends for 1.8 km on both sides of the highway from the north side of Millar Creek to Keddy Swamp tributary No. 3 for a combined length of 3.6 km.

Wildlife Warning Signs

Wildlife warning signs are the Ministry's most commonly used wildlife-vehicle accident mitigation measure because they are the least expensive and easiest to install and maintain (Figure 19) Standard sized signs (75 cm x 75 cm) cost approximately $150 while oversized signs (244 cm x 122 cm) cost approximately $550. The Ministry understands wildlife warning signs lose their effectiveness over time if motorists do not perceive a hazard. Swedish research has found 60% of motorists do not notice wildlife signs. To ensure its signage is as effective as possible, the Ministry's Traffic Engineering Section continually evaluates warning sign designs developed by transportation agencies in other jurisdictions. To increase the long-term effectiveness of its wildlife warning signs and motorist awareness

DESCRIPTION

Figure 19. Wildlife Warning Signs

Z-041_

A B C D E F

Example: (Using a "C" sign)

Substitute one of the above signs associated with the ungulate type to suite desired sign.

Approval Required for all Oversize Signs.

Z-041C

Z-041C X

Z-041C XX

SPECIFICATIONS

Type: Z Record

Size:
- Z-041_ 75.0cm x 75.0cm
- Z-041_X 120.0cm x 120.0cm
- Z-041_XX 244.0cm x 122.0cm

Substrate:
- Z-041_ Aluminum
- Z-041_X Aluminum
- Z-041_XX MD Plywood

Colours: Black on Yellow
Shield: N/A
Font: To be determined

HISTORY

Jan 2001	LM

Done for HQ to encompass and cleanup related Z-041 signs.

BRITISH COLUMBIA

Ministry of Transportation and Highways

Engineering Branch

SIGNSHOP DESIGN

Senior Traffic Engineer

Date

of wildlife hazards, the Ministry recently developed a high level warning sign to indicate when a wildlife hazard is imminent or when the historic wildlife collision rate is extreme. These signs are particularly useful for addressing short-term and seasonal use for migration events, and other unique wildlife activities, such as salt-licking on roads by mountain sheep.

The Ministry is currently investigating the potential for using WARS data to develop a Changeable Message Sign (CMS) protocol to provide motorists with species-specific, seasonal wildlife warning messages on existing CMS's to more accurately reflect local wildlife conditions.

Wildlife Warning Reflectors

The Ministry has been installing wildlife warning reflectors since the late 1980's as part of its continued effort to reduce wildlife-related accidents. The reflectors are prisms mounted on posts and installed along the sides of the highway as a means of deterring animals from entering the highway when vehicles are present. At night, as the headlights of an approaching vehicle strike the reflectors they reflect beams of light at ninety-degree angles to the roadway. The reflected light apparently catches the attention of animals and distracts them long enough to delay their movement onto the road until the vehicle has passed.

To date, reflectors have been installed at over 95 locations throughout the Province (Appendix C). Reflectors cost approximately $10,000/km to install along both sides of a highway. The reflectors have been installed on either one side or both sides on over 160 kilometres of highway. The general locations of the reflector installations are shown on the Maintenance Contract Area maps (Appendix B). Reflectors have been extensively used in Region 3 along highways prone to high numbers of deer-related accidents.

The success of wildlife warning reflectors for reducing wildlife accidents has been the object of much discussion and speculation. Research by MoT and other transportation agencies continues to provide inconsistent evaluations of the devices.

Based upon the WARS data collected, it is apparent not all wildlife reflector installations have been successful. Most installations are less than 2 kilometres long, with 17% being 0.5 kilometres or less in length. Short installations make evaluation difficult because it is easier for animals to travel to the ends of the reflector installations and cross the highway. Given the relatively short distances of the majority of the reflector installations, the relatively low number of wildlife accidents recorded before and after the reflectors were installed, and the lack of measurable controls, determining if the reflectors produce statistically significant reductions in the numbers of deer-related motor vehicle accidents is very difficult.

The "before and after" method typically used to evaluate reflectors does not give a true picture of effectiveness because there is no control of those factors which can change during the course of the evaluation period, such as weather, traffic flow, and deer population densities (Damas and Smith, 1983). However, even if accidents are reduced following the implementation of a safety project, it does not necessarily follow that the decrease was caused by the project (Griffin, 1997).

Wildlife Warning Reflector Installation Case Studies

Highway 3, located near the Canada/US border in British Columbia, north of the U.S. states of Washington, Idaho, and Montana, has one of the worst records for ungulate related motor vehicle accidents in British Columbia. In an attempt to reduce the number of deer related motor vehicle accidents, MoT installed wildlife warning reflectors on a 9.37 km section of Highway 3 (LKI Segment 1325), east of Grand Forks, and on a 7.45 km section of Highway 3 (LKI Segment 1375), east of Creston. The installations were completed in March 1995. These are the longest continuous reflector installations in British Columbia.

a) Highway 3 (Segment 1325)

When comparing the deer accident rates before and after the reflector installation, it appears the number of deer accidents recorded increased after the installation (Figure 21). When comparing the deer accident rate for the 9.37 km reflectorized section of the highway with the deer accident rate for an immediately adjacent 9.37 km non-reflectorized section of the highway, it appears the installation of reflectors did not alter the overall local accident trends.

b) Highway 3 (Segment 1375)

When comparing the deer accident rates before and after the reflector installation, it appears the number of deer accidents recorded increased after the installation (Figure 21). When comparing the deer accident rate for the 7.45 km reflectorized section of the highway with the deer accident rate for immediately adjacent 7.45 km non-reflectorized sections of the highway, it appears the installation of reflectors did not alter the overall local accident trends.

Further Study

Although these trends were not observed as part of a controlled scientific experiment, they raise questions about the effectiveness of wildlife warning reflectors. When comparing the deer accident rates before and after a reflector installation, there appears, at least in these two cases, to be no consistent accident rate drop after the reflector installation that can be specifically attributed to the reflectors.

A more thorough analysis of WARS data is required to determine the long-term effectiveness of wildlife warning reflectors on provincial highways. There may be many reasons why dramatic fluctuations in the number of accidents occur, including climate, traffic speed and volume, time of day, and wildlife movement. ICBC has found approximately 45% of the animal collisions which occur in the Southern Interior of British Columbia occur between 7:00 p.m. and 12:00 p.m. (Table 14) (Gilfillan, 2001).

In 1999, ICBC provided MoT worth $19,000 to initiate a controlled study to determine the effectiveness of wildlife warning reflectors on a 3.4 km stretch of Highway 5 between Clearwater and Vavenby, in central British Columbia. It is anticipated data will be collected for at least 2 to 3 years before any conclusive results can be expected.

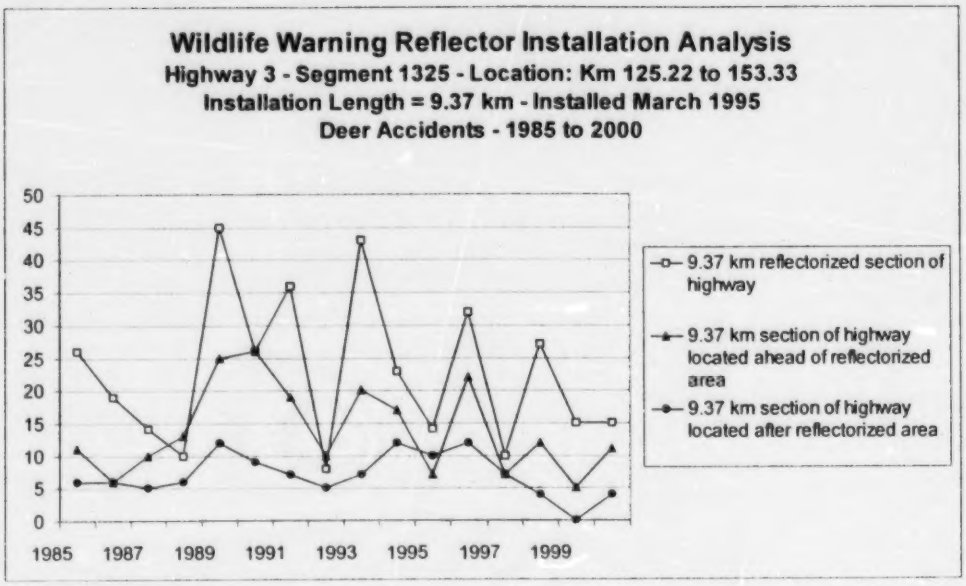


Figure 20. Wildlife Warning Reflector Installation Analysis (Highway 3, Segment 1325)

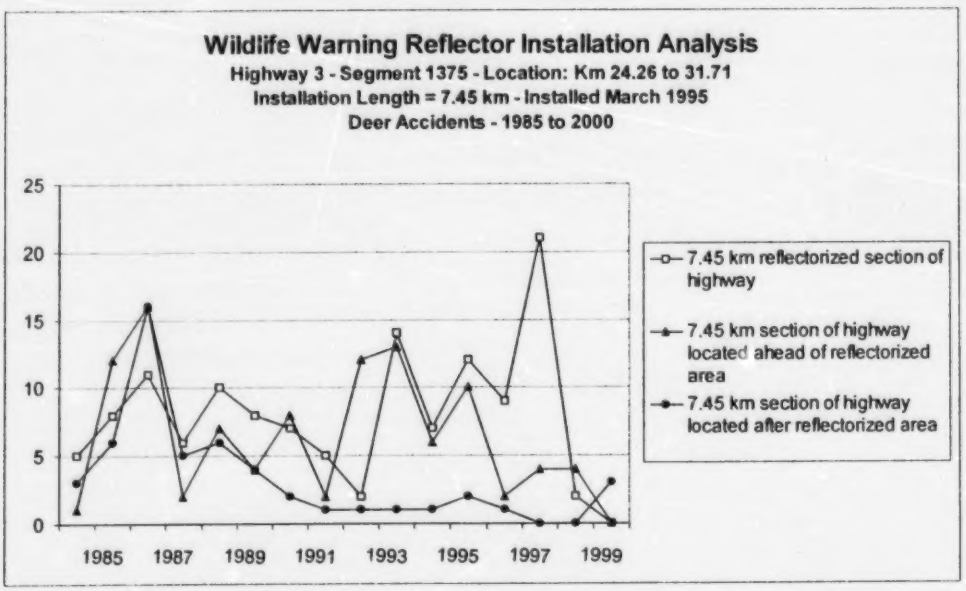


Figure 21. Wildlife Warning Reflector Installation Analysis (Highway 3, Segment 1375)

Table 14. Hourly Distribution of Animal Collisions in Southern Interior of B.C.

Time	Animal Collisions (%)	Time	Animal Collisions (%)
12:00 a.m.	2	12:00 p.m.	2
1:00 a.m.	6	1:00 p.m.	2
2:00 a.m.	2	2:00 p.m.	4
3:00 a.m.	2	3:00 p.m.	2
4:00 a.m.	4	4:00 p.m.	0
5:00 a.m.	2	5:00 p.m.	1
6:00 a.m.	3	6:00 p.m.	3
7:00 a.m.	7	7:00 p.m.	7
8:00 a.m.	2	8:00 p.m.	8
9:00 a.m.	3	9:00 p.m.	12
10:00 a.m.	6	10:00 p.m.	9
11:00 a.m.	2	11:00 p.m.	9

Spectrometric Evaluation of Wildlife Warning Reflectors

In addition to field tests, MoT began examining how wildlife warning reflectors may influence the roadside behavior of deer. As a first step toward understanding how wildlife warning reflectors operate, MoT conducted tests on different coloured Swarflex and Strieter-Lite reflectors to determine their fundamental spectrometric and photometric properties (Sivic and Sielecki, 2001). The tests were designed to measure the reflected light spectrum, luminous intensity and light distribution in a horizontal and vertical plane. MoT has traditionally used red coloured Swarflex and Strieter-Lite reflectors. Questions have been raised regarding the effectiveness of red coloured reflectors for deer (Zacks, 1986). In light of deer vision research (Jacob et al., 1994), MoT is investigating if other colours (green, amber and white) of reflectors may be more effective than red ones. Installation of white reflectors has begun on selected sections of Highway 19 as part of the Vancouver Island Highway Project.

COST OF WILDLIFE-RELATED MOTOR VEHICLE ACCIDENTS

Wildlife-related Motor Vehicle Accidents

The cost of wildlife-related motor vehicle accidents to the residents of British Columbia is substantial. The financial impact on the province can be broken down into the following:

- Reported Accidents
- Unreported Accidents
- Accident Clean-up
- Lost Provincial Hunting License Revenues
- Lost Value of Wildlife

Reported Accidents

In addition to killing wildlife, wildlife-related motor vehicle accidents represent a serious threat to the motoring public. These accidents can result in human fatalities, injuries, and damage to motor vehicles (Table 15). Any accident may also result in multiple human fatalities.

Table 15. Wildlife-Related Fatal, Injury and Property Damage Only Accidents (1987 to 1995)

Year	Fatal Accidents	Total Number of Deaths	Injury Accidents	Property Damage Only Accidents
1987	1	1	198	2,226
1988	0	0	256	2,596
1989	1	3	199	2,590
1990	1	1	237	2,821
1991*	1	2	241	1,925
1992	2	6	238	1,975
1993	0	0	248	1,954
1994	3	9	256	2,072
1995	3	5	221	1,678

*Note: In 1991, the minimum reportable aggregate property damage accident value increased from $400 to $1000.
Source: Highway Accident System, Highway Safety Section, Engineering Branch, MoT

In British Columbia, the majority of motor vehicles are insured by the Insurance Corporation of British Columbia (ICBC). On average, ICBC processes approximately 6600 wildlife-related accident claims a year[4]. The average cost of these claims was about $2200. Between 1997 and

[4] Gilfillan, G., 2001, Personal Communication, Project Manager, Winter Road Research & Development, Kamloops, B.C.

2000, ICBC paid out over $67 million in wildlife-related motor vehicle accident claims (Table 16). In 2000, ICBC had over 8,800 wildlife-related accident claims.

Table 16. ICBC Wildlife-related Motor Vehicle Accident Claims (1997 to 1999)

	1997	1998	1999	2000	Total
Claims	$15.1 million	$15.8 million	$17.7 million	$18.9 million	$67.5 million

Source: Insurance Corporation of British Columbia, 2001

ICBC estimates its accident claims capture 75% of the number of wildlife-related accidents that occur in British Columbia. Few people in British Columbia do not carry comprehensive insurance. With ICBC insurance policies, there is no penalty for a comprehensive claim so such claims do not affect policy premiums. Of the 25% of the number of British Columbia wildlife-related motor vehicle accidents ICBC estimates go unreported to it, ICBC estimates 10% involve out-of-province vehicles, 10% involve vehicles with less than $100 in damage, and 5% of the accidents are reported to other insurance companies in British Columbia.

The societal costs of motor vehicle-related accidents have also been estimated by the British Columbia Transportation Financing Authority and the impact to the Province is considerable (Table 17)[5].

Table 17. Societal Costs of Motor Vehicle Accidents (BCTFA)

Accident Severity Class	Societal Cost
Fatality	$4.17 million
Injury	$97,000
Property Damage	$6,000

Source: Highway Safety Improvement Program Manual, MoT

Unreported Accidents

Except for fatal accidents, not all wildlife-related motor vehicle accidents which occur in British Columbia are reported in the province. Some accidents involve tourists or visitors from outside British Columbia. In such cases, many wildlife-related accidents are reported in other jurisdictions. Other accidents involve minor damage vehicle owners either ignore or pay for the repairs privately.

If one assumes the 6600 accidents reported to ICBC represent 75% of the actual number of vehicle damaging, wildlife-related accidents that occurred on Provincial highways, one can estimate an additional 1650 vehicles were damaged in wildlife-related accidents.

If one assumes these motor vehicles accidents incurred an average of $2300 in damages, the total unreported damage incurred by motor vehicles in British Columbia in 1999 totaled $3.8 million.

[5] Perkins, M., 1999, Highway Safety Improvement Programs Manual, British Columbia Ministry of Transportation

Accident Clean-up

Ministry Maintenance Contractors incur costs due to staff and equipment time required for the clean-up of wildlife-related accidents and the disposal of animal remains. Depending on the size of the animal involved and the location of the accident, the cost of clean-ups can vary dramatically. While smaller animals, such as porcupine and skunks, may be handled by a single person in one vehicle, larger animals, such as moose, elk, and caribou, often require two or three people with two vehicles and a hydraulic boom.

If one assumes the following staff and equipment time costs:

- $25 for small-sized animals (fox, porcupine, skunks, etc),
- $100 for medium-sized animals (bear, cougar, deer, mountain sheep, etc), and
- $350 for large-sized animals (caribou, elk, moose, etc);

Ministry Maintenance Contractors spent over $580,000 dealing with wildlife-related accident clean-up and disposal in 2000. Between 1991 and 2000, it is estimated Ministry Maintenance Contractors spent over $5.2 million on wildlife-related accident clean-up and disposal. These expenditures do not include the costs incurred by the Maintenance Contractors for insurance premiums and lost employee productivity or the Workers' Compensation Board for compensation payments when workers get injured dealing with wildlife-related accidents.

Lost Provincial Hunting License Revenues

In British Columbia, hunting license sales generate millions of dollars for the Provincial Government each year. The value of hunting licenses varies greatly between species and whether or not the hunter is a British Columbia resident (Table 18).

If every wild game animal reported killed on provincial highways represented an opportunity to sell a hunting license, the Province of British Columbia lost between $80,000 and $400,000 in hunting license revenues in 2000. If a 3 to 1 factor of unreported to reported animals killed is used, the Province of British Columbia could have lost between $300,000 and $1.5 million in hunting license revenues in 2000.

Table 18. Provincial Hunting License Fees for Residents and Non-residents

Species	Resident fees ($)	Non-resident fees ($)
bear	20	130
caribou	20	150
cougar	30	150
deer	15	75
elk	25	150
grizzly bear	80	530
moose	25	150
mountain goat	30	200
mountain sheep	590	400

Source: British Columbia Ministry of Water, Land and Air Protection (MWLAP)

Lost Value of Wildlife

The Wildlife Branch of the British Columbia Ministry of Water, Land and Air Protection (MWLAP) has done extensive analysis of the economic value of wildlife resources in the province[6]. In British Columbia, participants in hunting and viewing make estimated current expenditures of about $466 million each year that are directly associated with their wildlife-related recreation.

The expenditures by participants in wildlife-related activities and their impacts on income and employment are spread throughout the Province and make important contributions to many rural economies. In 1996, MWLAP estimated expenditures on resident hunting and wildlife activities supported about $205 million of Provincial Gross Domestic Product and $136 million of household income[7].

Lost Value of Wildlife for Resident and Non-resident Hunters

Approximately 100,000 British Columbia residents purchase hunting licenses annually and spend an estimated 1.5 million days hunting in the province each year[8]. Approximately 4,500 non-residents spend about 46,000 days hunting in British Columbia each year[9].

One measure of the value of wildlife lost due to motor vehicle-related accidents can be estimated by determining how much hunters are willing to pay to hunt.

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[6] Reid, R., 2001, Personal Communication, Economist, British Columbia Ministry of Water, Land and Air Protection (MWLAP), Wildlife Program, Victoria, B.C.
[7] Ibid
[8] Ibid
[9] Ibid

MWLAP surveyed thousands of resident hunters in 1996 to determine their "willingness to pay" in order to obtain an animal from a certain species (Table 19). According to MWLAP, the "willingness to pay" by British Columbia hunters to obtain a certain species of animal can be considered the equivalent of the "true net market value" of that species. For non-resident hunters, the "net return" to the Province is determined to be the value of their expenditures less the cost to the Province for supplying the services they need[10].

Table 19. Resident and Non-resident Hunters Net Value to British Columbia

	Net Value to British Columbia	
Species	Resident Hunters ($)	Non-resident Hunters ($)
bear	950	2,340
caribou	2,960	2,930
cougar	2,050	3,400
deer	1,270	7,450
elk	3,250	3,290
moose	1,250	1,680
mountain sheep	4,700	4,170

Source: British Columbia Ministry of Water, Land and Air Protection (MWLAP), Wildlife Program

For every wild game animal reported killed on provincial highways in 2000, the Province of British Columbia would have earned over $6 million in the market value of the animals to resident hunters. If a 3 to 1 factor of unreported to reported animals killed is used, the Province of British Columbia would have lost over $23 million from resident hunters in 2000.

The value of non-resident hunting in British Columbia is significant. Non-resident hunters contribute to the provincial economy by purchasing hunting licenses and supplies, and hiring hunting guides. If every wild game animal reported killed on provincial highways represented an opportunity for non-resident hunters to hunt in the Province, the Province of British Columbia would have lost over $30 million in net returns in 2000. If a 3 to 1 factor of unreported to reported animals killed is used, the Province of British Columbia would have lost over $113 million in net returns from non-resident hunters in 2000.

The true market value of wildlife may be more accurately determined by public auction, but only if all hunting opportunities were auctioned. As a fund raising initiative supported by the Alberta Provincial Government, the Rocky Mountain Elk Foundation auctioned one non-resident elk hunting permit ("tag") and one non-resident bighorn sheep tag in 1998, 1999 and 2000. The successful bids on the tags are shown in Table 20.

[10] Reid, R., 2001, Personal Communication, Economist, British Columbia Ministry of Water, Land and Air Protection (MWLAP), Wildlife Program, Victoria, British Columbia

Table 20. Rocky Mountain Elk Foundation Elk and Bighorn Sheep Tag Auction Results

Auction Item	1998	1999	2000
Elk tag (non-resident)	$20,874	$26,265	$32,340
Bighorn Sheep tag (non-resident)	$607,500	$495,000	$308,000

Source: Nicholson, J., 2001, Personal Communication, Rocky Mountain Elk Foundation, Edmonton, Alberta

In January, 2000, MWLAP auctioned off a mountain sheep hunting license in Reno, Nevada for $260,000 (Canadian dollars) as a fund raising initiative for the British Columbia Habitat Conservation Trust Fund to help support mountain sheep management[11]. In 2001, MWLAP auctioned off another mountain sheep hunting license for $170,000 (Canadian dollars)[12]. Although the successful bids in the auctions for British Columbia and Alberta wild game animals continue to be considerably higher than the value MWLAP has generally determined for these types of animals, the auction results show certain species wildlife are considered very valuable by some hunters. One should note these auction results are extreme values and they are not representative of typical hunter values.

Lost Value of Wildlife for Non-hunting Residents

No species-specific figures are available for the value of wildlife to non-hunting residents[13]. Regardless, the presence of wildlife generates considerable economic activity in British Columbia. MWLAP estimates 863,000 provincial residents spent 18 million days in direct wildlife activities with the main purpose of watching, photographing, feeding and studying wildlife in the field in 1996[14].

The impact of motor vehicle-related accidents on wildlife species with critically low populations can have serious implications on wildlife viewing activities. Species, such as mountain goats and mountain sheep, which attract viewing attention, have low reproduction rates and limited areas of habitat. Consequently, the loss of even a few members of a small herd in motor vehicle-related accidents can threaten the survival of the herd and reduce the long-term provincial economic benefits generated by residents viewing the herd.

MWLAP estimates British Columbia residents participating in direct wildlife activities, where the main purpose of a trip was to see wildlife in the field, spent almost $392 million in 1996, contributing over $174 million to the Provincial Gross Domestic Product.

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[11] Reid, R., 2001, Personal Communication, Economist, British Columbia Ministry of Water, Land and Air Protection (MWLAP), Wildlife Program, Victoria, British Columbia

[12] Ibid

[13] Ibid

[14] Ibid

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FEEDBACK

WARS is only made possible by the collective efforts of the Ministry's Maintenance Contractors who complete the monthly accident report forms, the District Highways Staff who assemble and proof them, and the Headquarters Staff who support the WARS database system. We would like to extend our thanks to everyone who contributes to the WARS system and helps keep the WARS as current as possible.

If you have any questions or comments regarding this publication, please let us know as we would appreciate your feedback.

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Facsimile: (250) 387-3736

APPENDIX A

Wildlife Accident Reporting System (WARS) Form H-0107 (2001/06)

BRITISH COLUMBIA

Ministry of Transportation

MONTHLY WILDLIFE ACCIDENT REPORT

Enter the day of the month (e.g. 1, 2, 3, ... etc.) in the "Day" column below.

MONTH *(Please Circle)* Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

YEAR _____

REGION *(Please Circle)* 1 2 3 4 5 6

DISTRICT _____

DISTRICT NO. _____

Day	Time of Kill 1 = Dawn 2 = Day 3 = Dusk 4 = Dark	Location of Killed Animal RFI = Road Features Inventory (optional) LKI = Landmark Kilometre Index (must be completed)						Deer Sign within 100m	Deer Rfictr	# Killed	Animal Type Please Specify Sex (Male / Female / Unknown) Please Use "Y" to indicate if Yearling or Younger (Other: Sheep, Caribou, Coyote, Porcupine, etc)												Comments
		Hwy	RFI		LKI		Nearest				Deer			Moose			Elk			Bear			Other	
		No.	Landmark	Offset	Segment	Km	Town	Y/N	Y/N		M	F	U	M	F	U	M	F	U	M	F	U	(please specify)	

Please provide the following information to assist in report follow-ups:

_____
Maintenance Contractor Contact (Please Print)

_____
Telephone

_____
Ministry District Contact (Please Print)

_____
Telephone

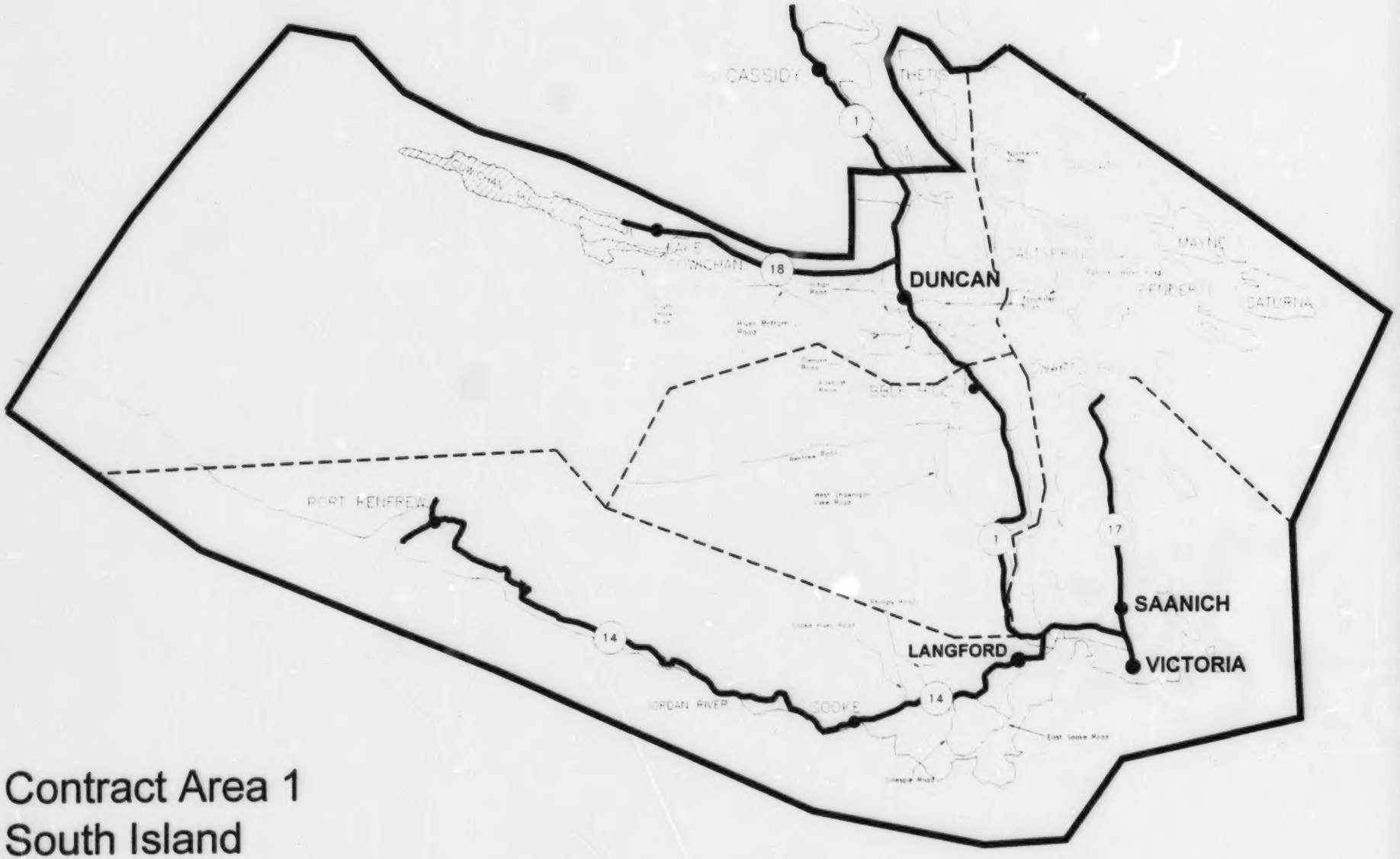
Within 30 days of completion, please send this form to:

Note: If you suspect that an animal has been the target of poachers, please contact your local Conservation Officer or call the ORR (Observe, Record, Report) Line at 1-800-663-9453.

H0107 (2001/06)

APPENDIX B

Ministry Maintenance Contract Areas



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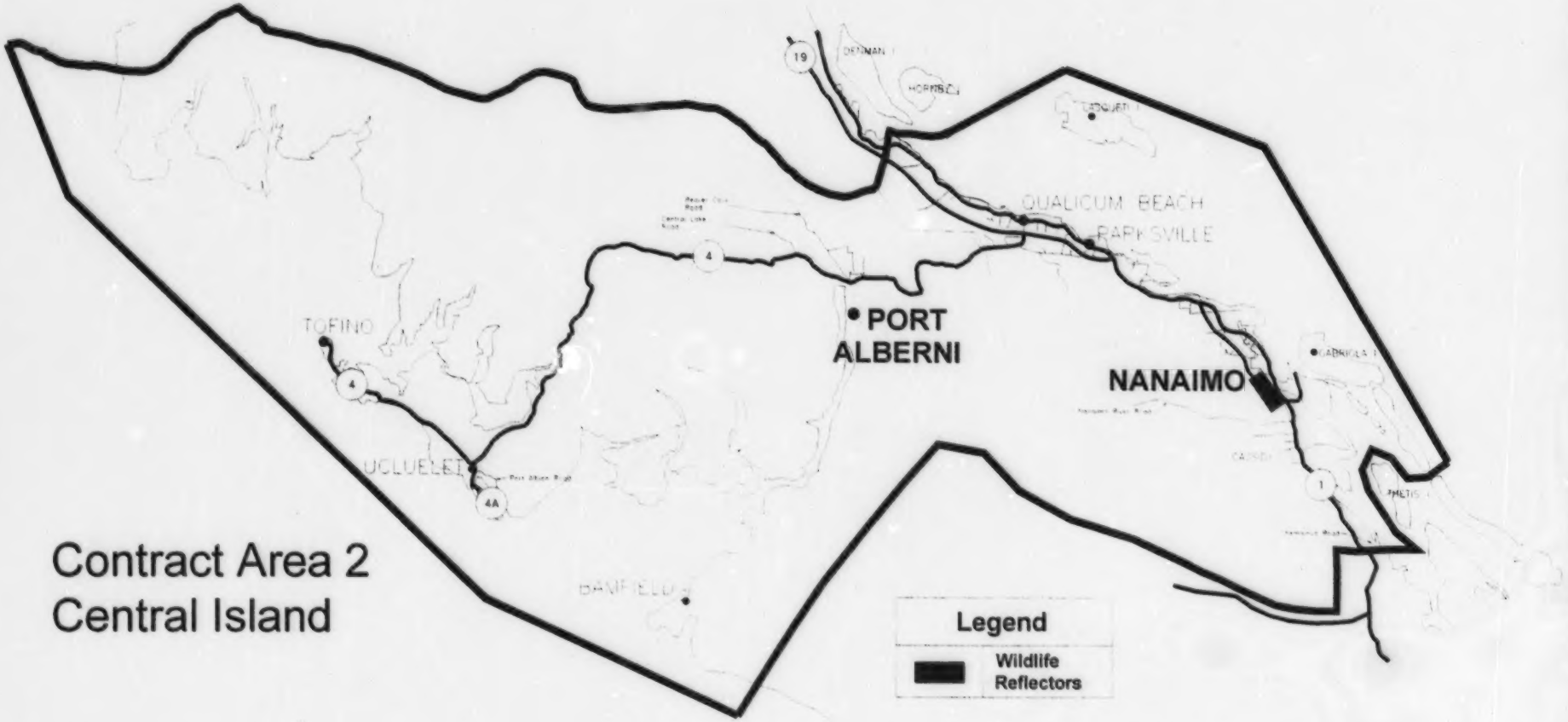
South Island



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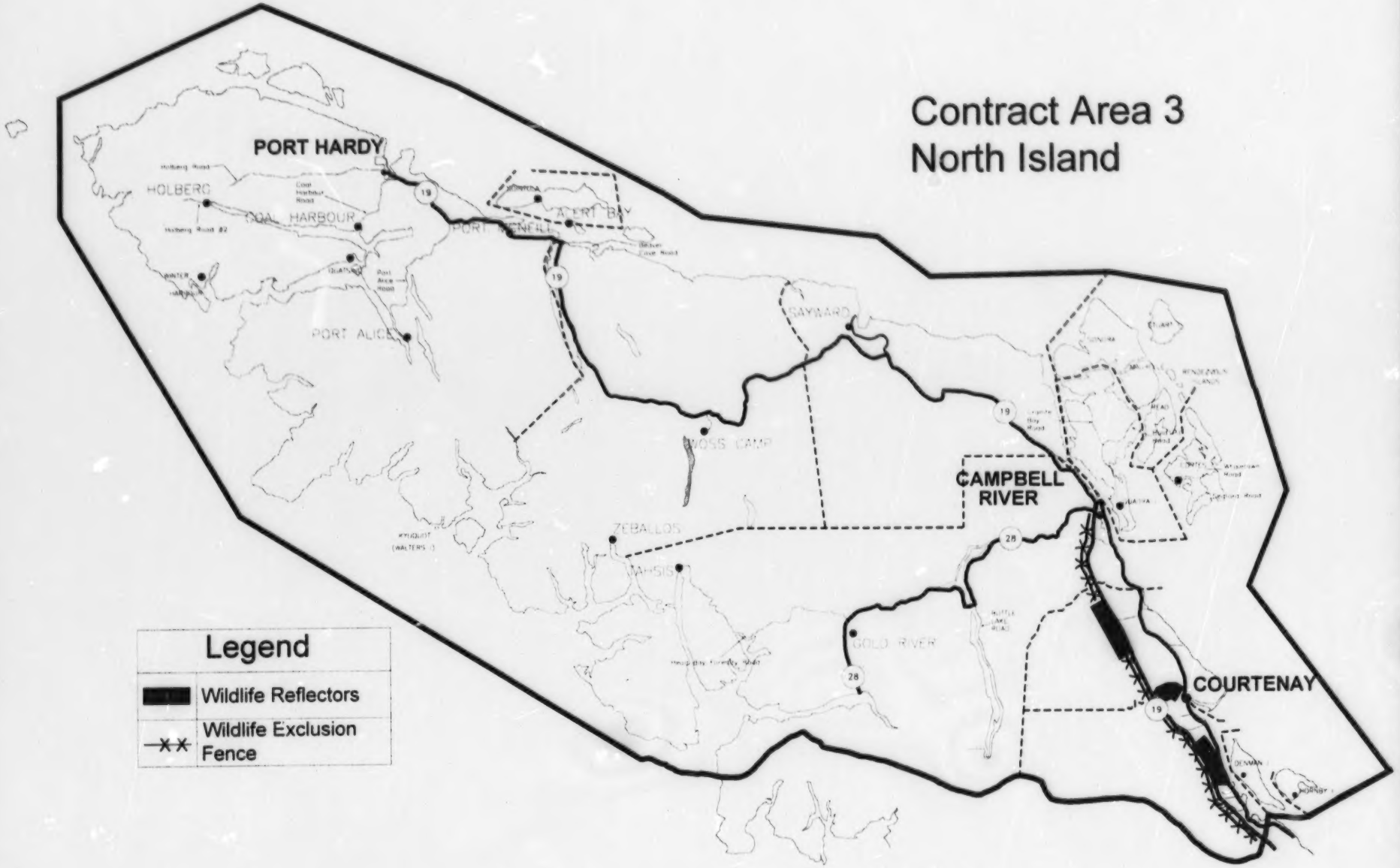
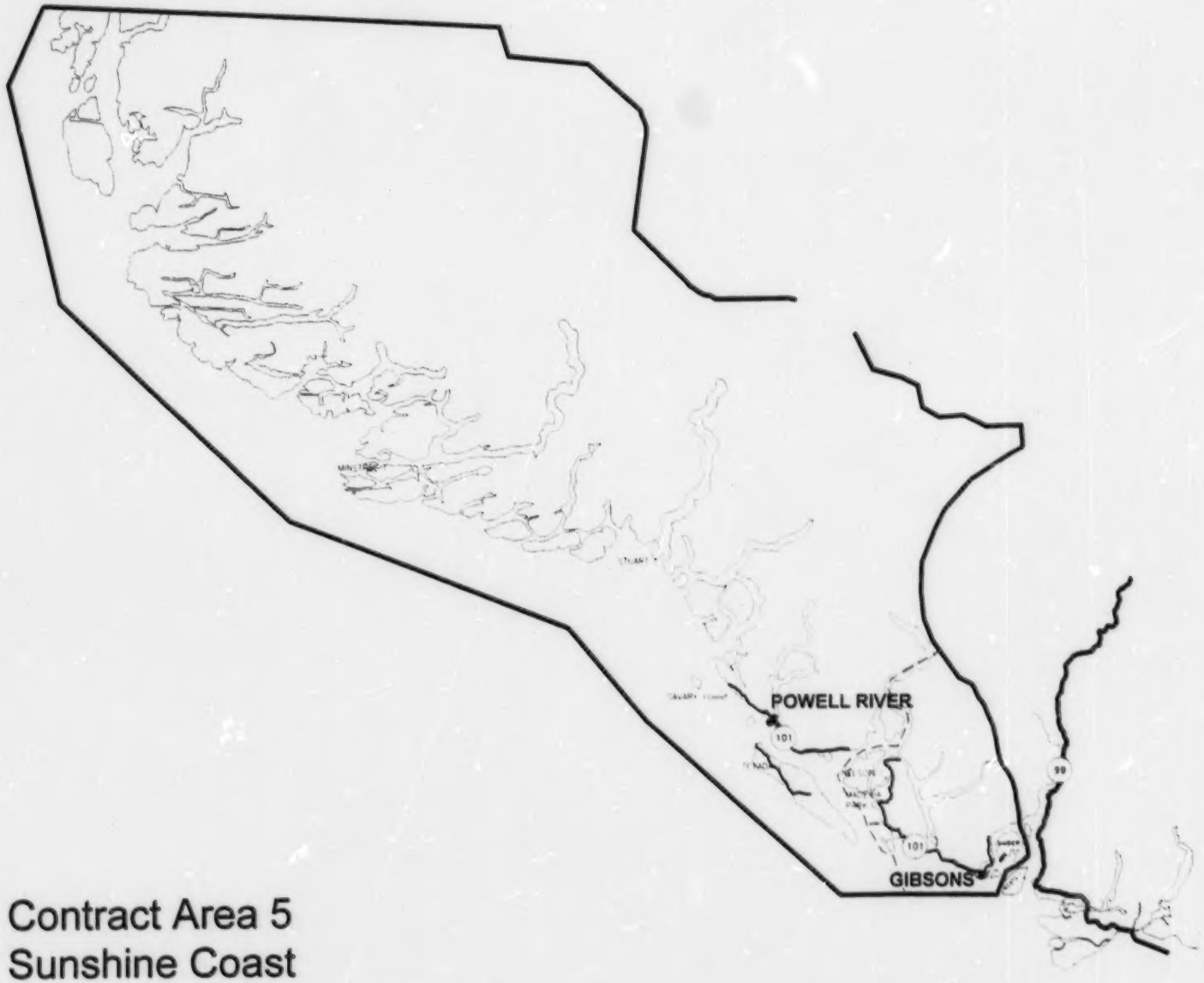
Central Island


Contract Area 3
North Island
PORT HARDY
HOLBERG
COAL HARBOUR
PORT ALICE
PORT HARDY
ALERT BAY
PORT MCNEILL
SAYWARD
WOSS CAMP
ZEBALLOS
GOLD RIVER
CAMPBELL RIVER
COURTENAY
Legend
Wildlife Reflectors
Wildlife Exclusion Fence

Contract Area 4
Howe Sound



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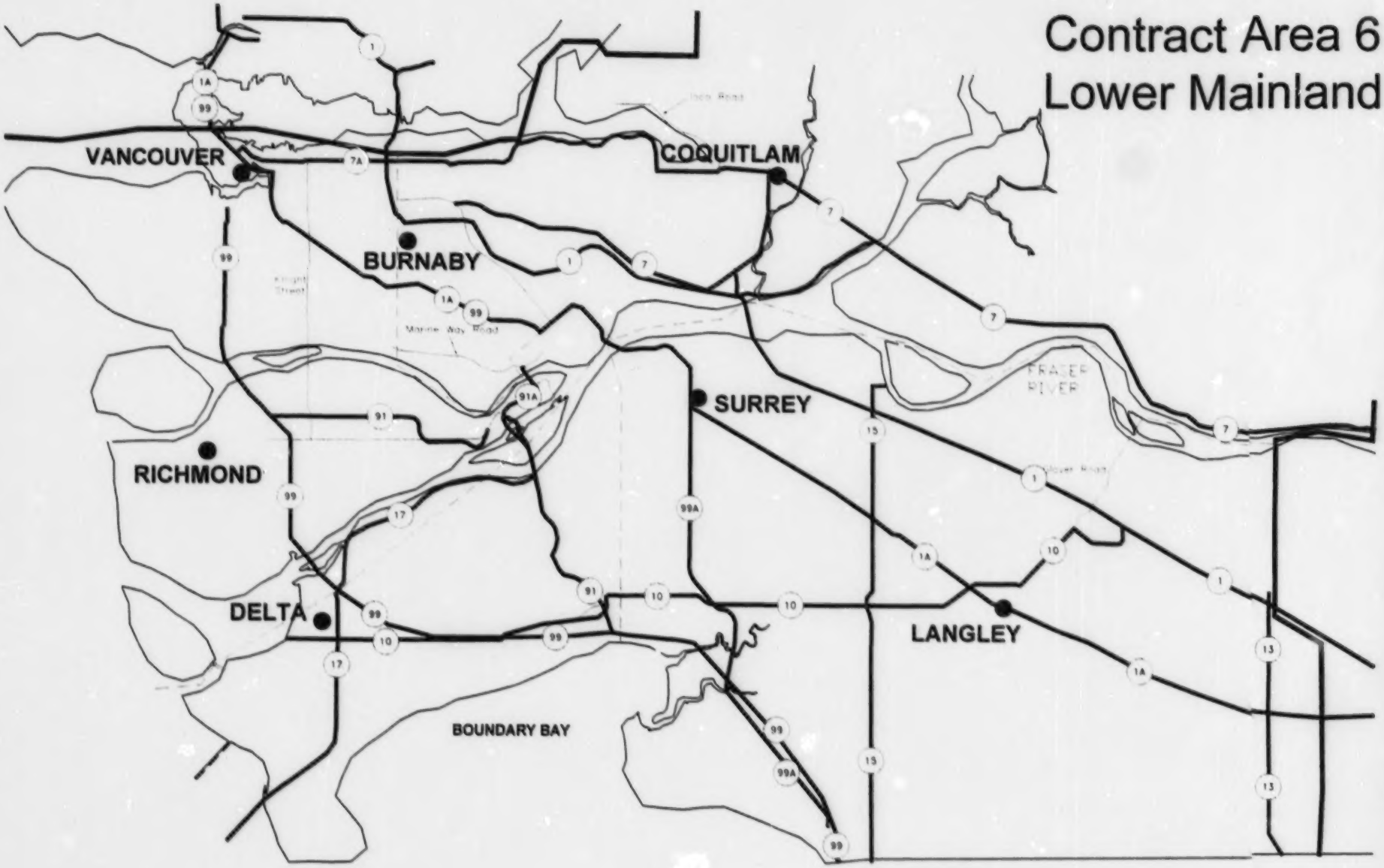
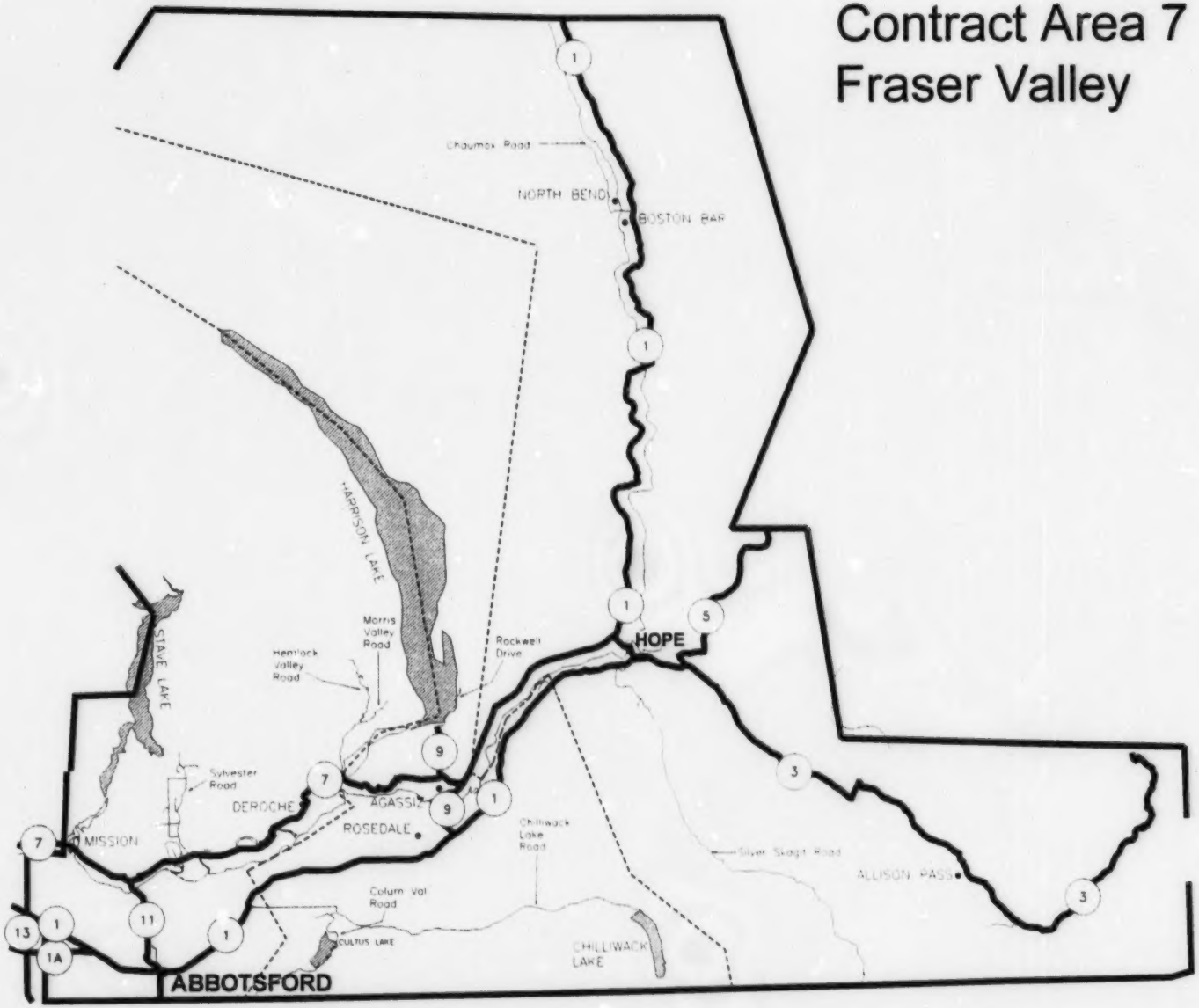

Contract Area 6
Lower Mainland
VANCOUVER
BURNABY
COQUITLAM
SURREY
RICHMOND
DELTA
LANGLEY
BOUNDARY BAY
FRASER RIVER

Contract Area 7
Fraser Valley

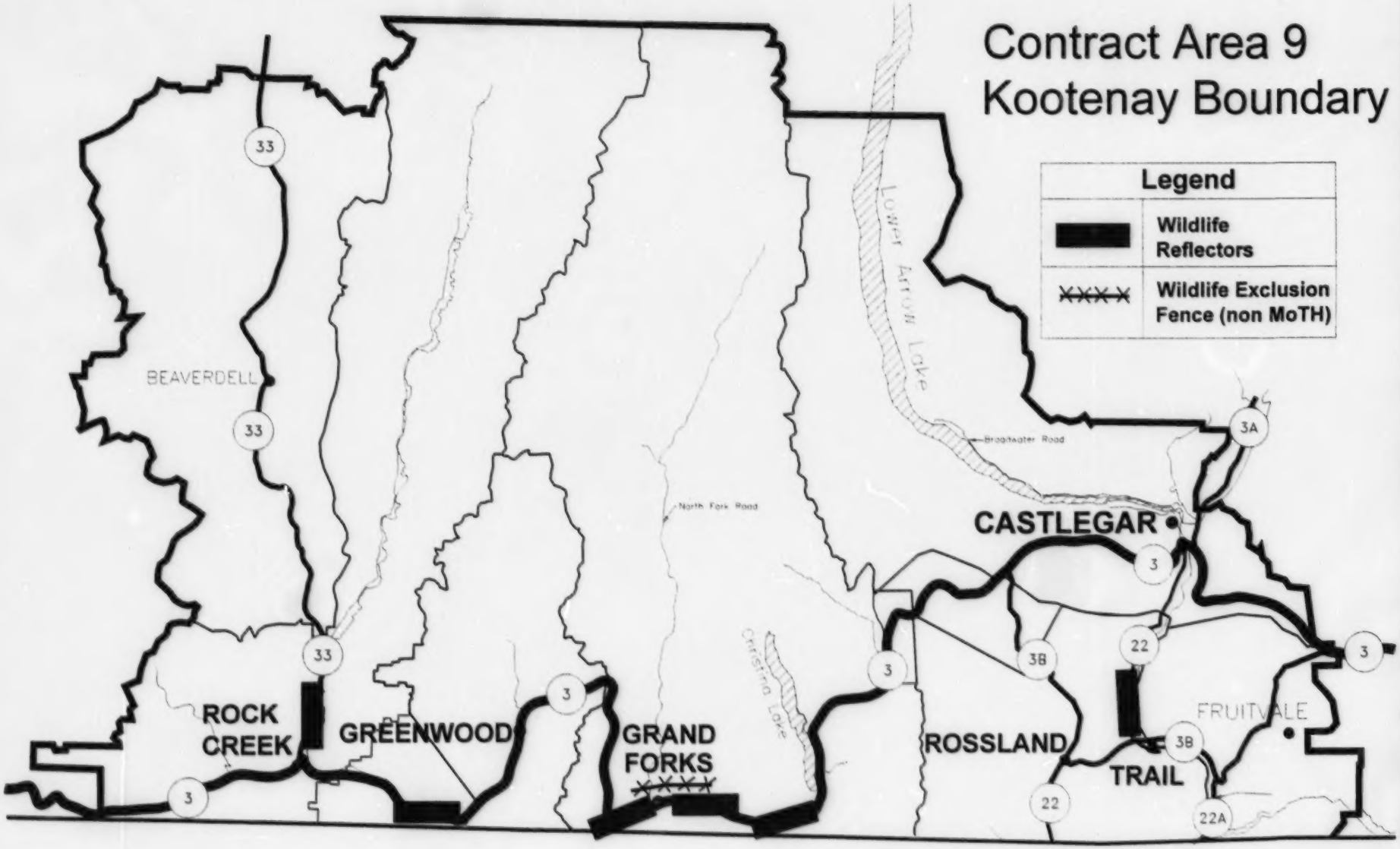


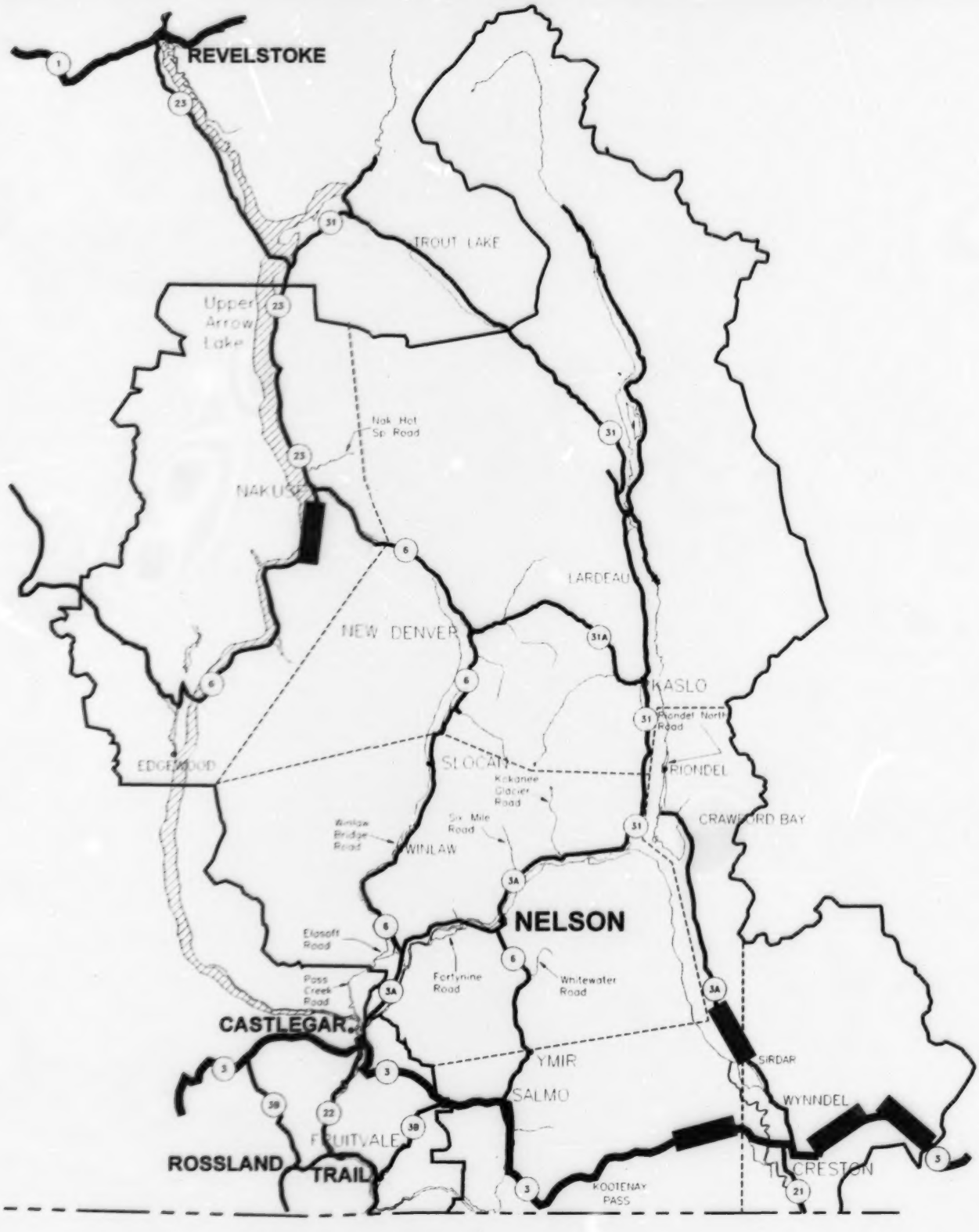
Contract Area 8
South Okanagan

Notes

***1. Fencing on Hwy 97C & 97 do not connect**

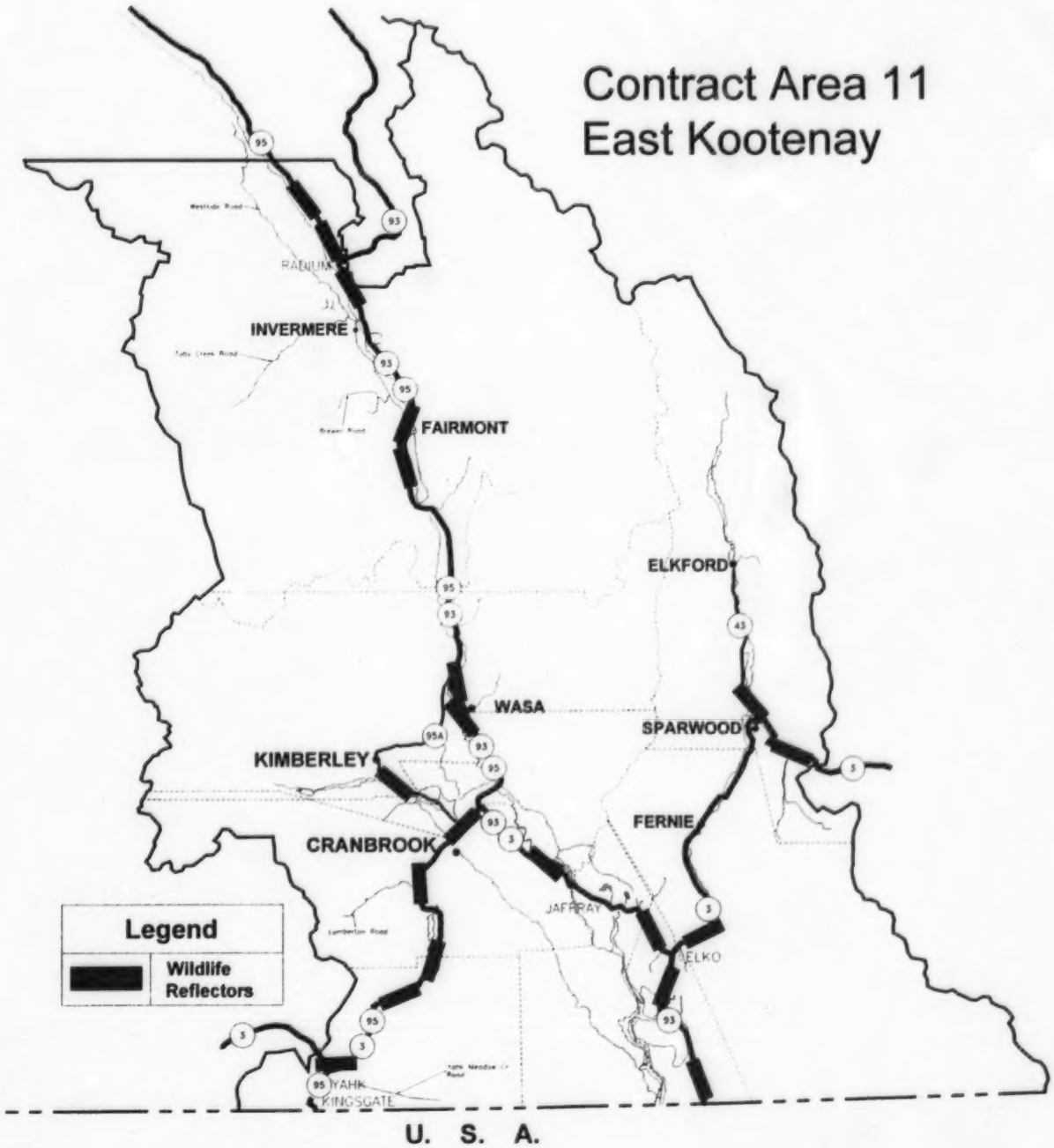
***2. Fencing to be complete Fall 2000**


Contract Area 9
Kootenay Boundary
Legend
Wildlife Reflectors
Wildlife Exclusion Fence (non MoTH)
BEAVERDELL
33
33
33
3
3
3
3A
3B
22
22
22A
3
3
CASTLEGAR
ROCK CREEK
GREENWOOD
GRAND FORKS
ROSSLAND
TRAIL
FRUITVALE
Lower Arrow Lake
Christina Lake
North Fork Road
Brodiwater Road



Contract Area 10
Central Kootenay

Legend	
	Wildlife Reflectors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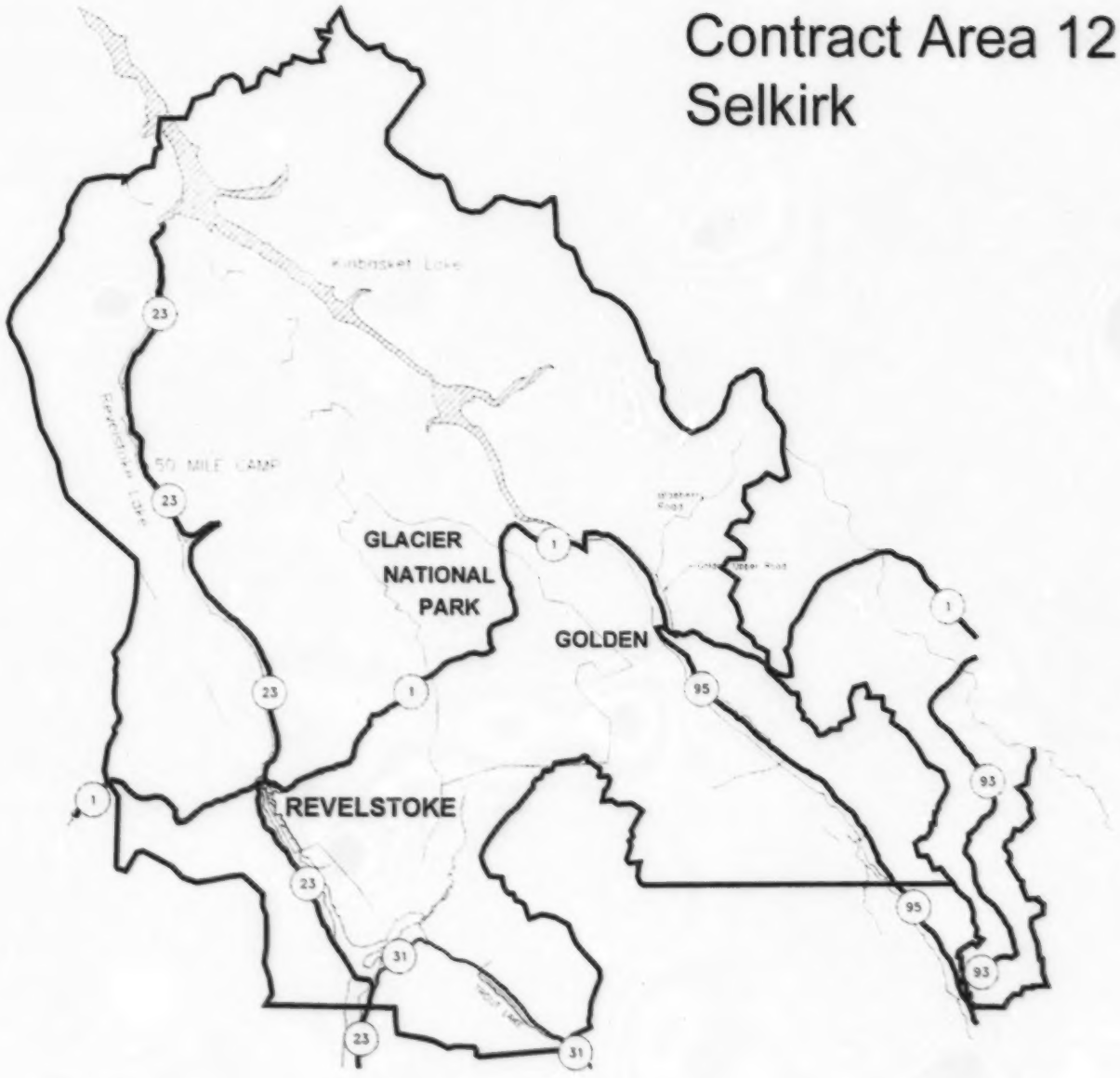
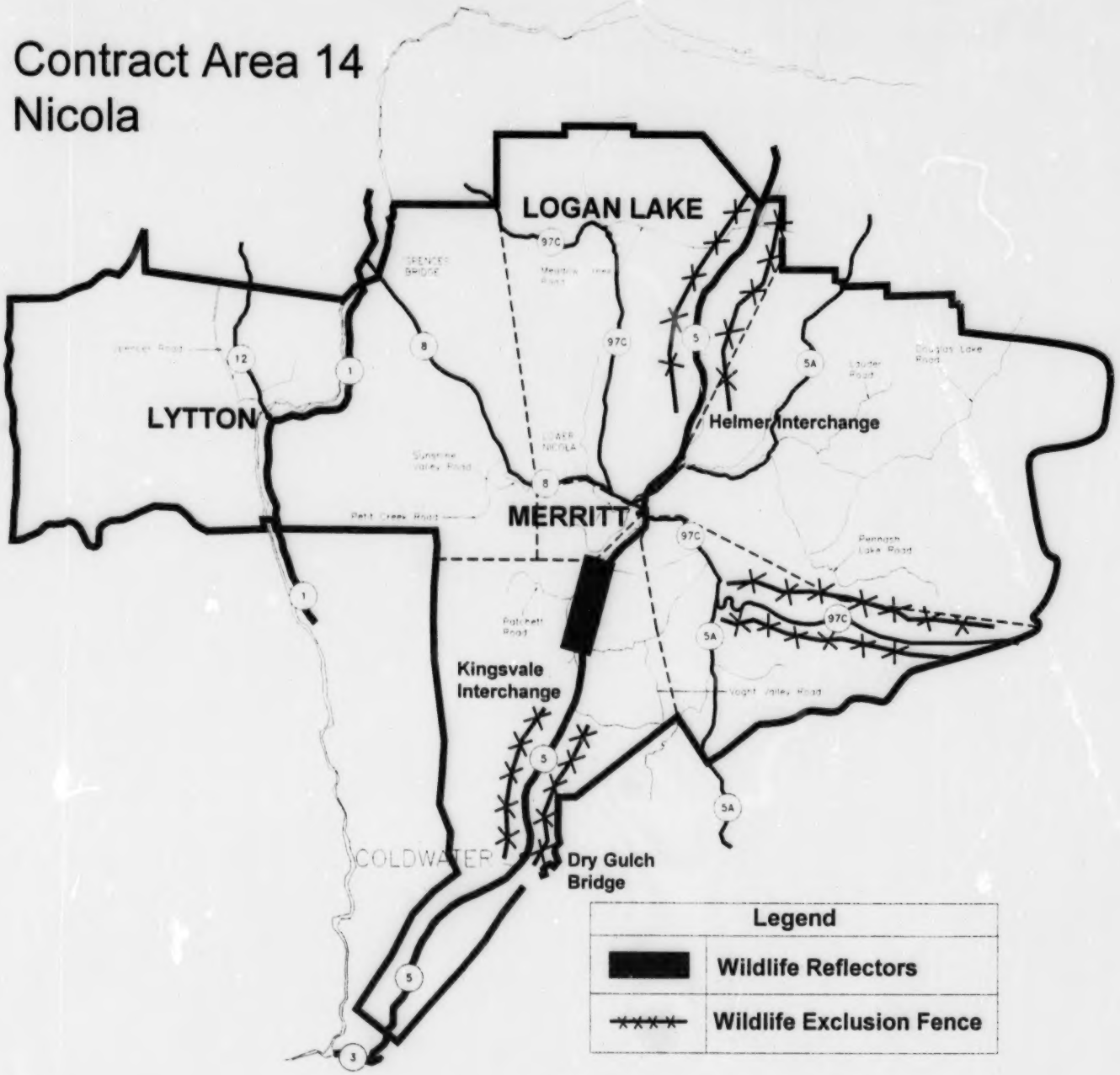
East Kootenay
RADIUM
INVERMERE
FAIRMONT
ELKFORD
WASA
SPARWOOD
KIMBERLEY
FERNIE
CRANBROOK
JAFFRAY
ELKO
YAHK
KINGSGATE
Legend
Wildlife Reflectors
U. S. A.

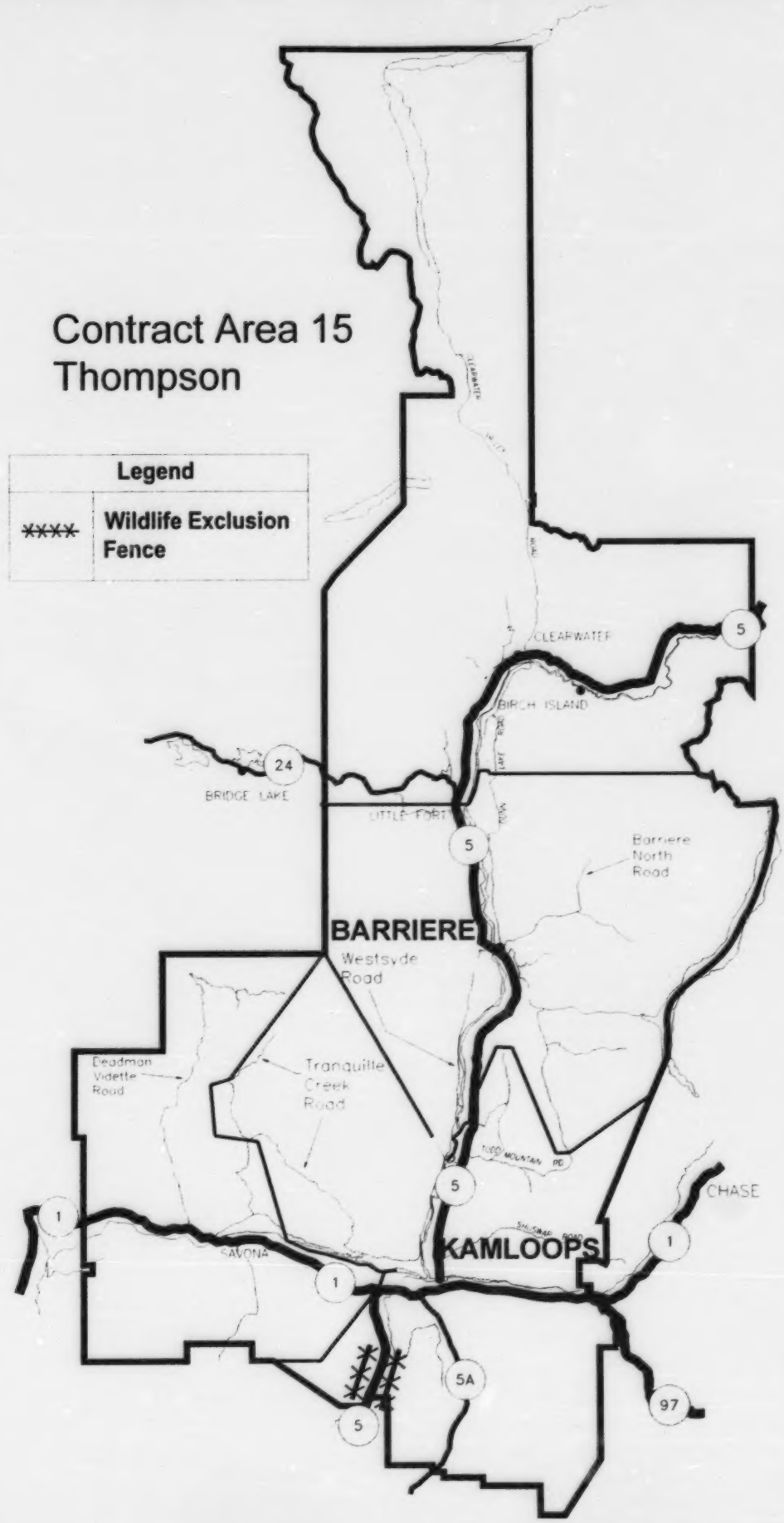
Contract Area 12
Selkirk



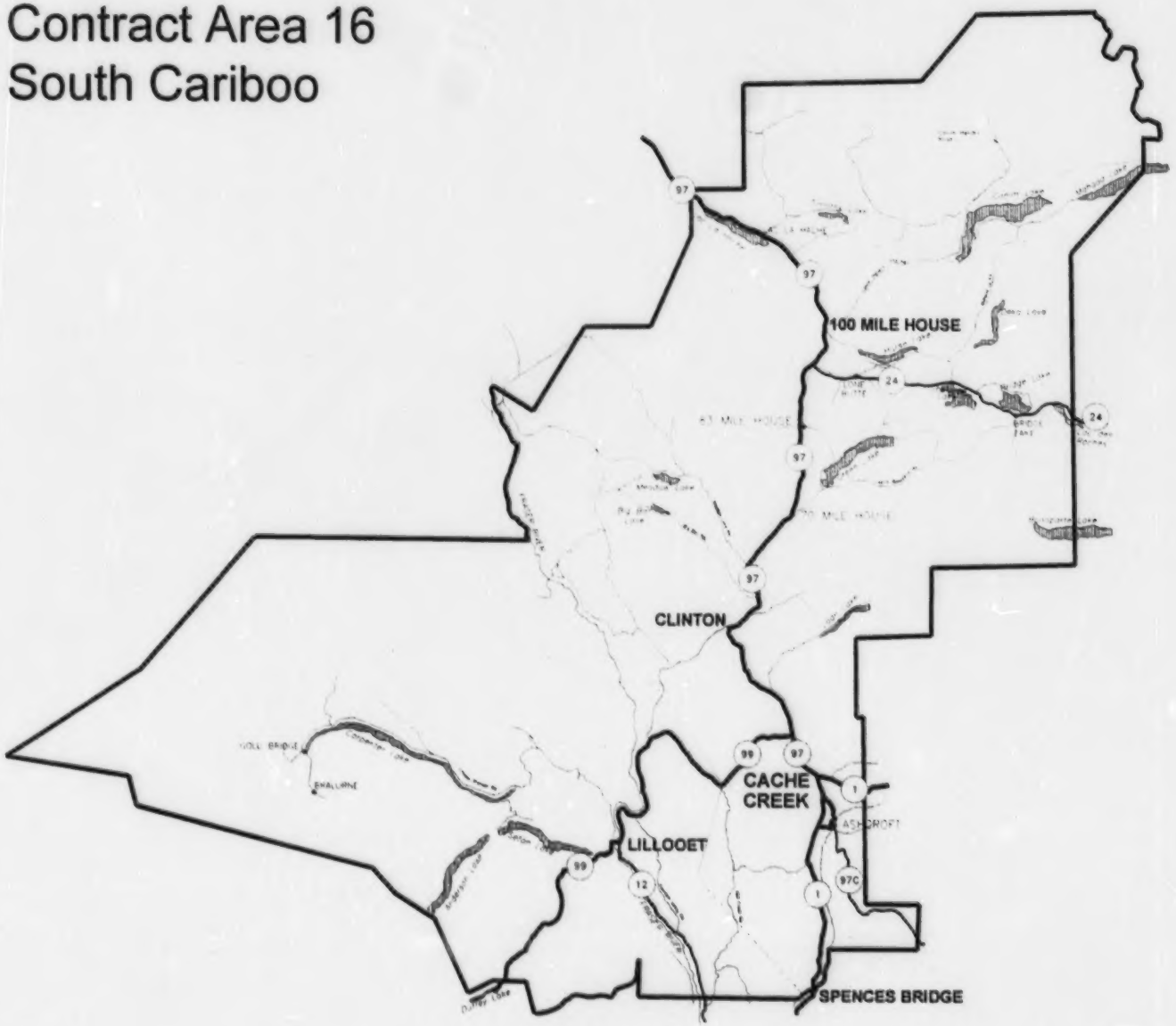
Contract Area 13
Okanagan - Shuswap

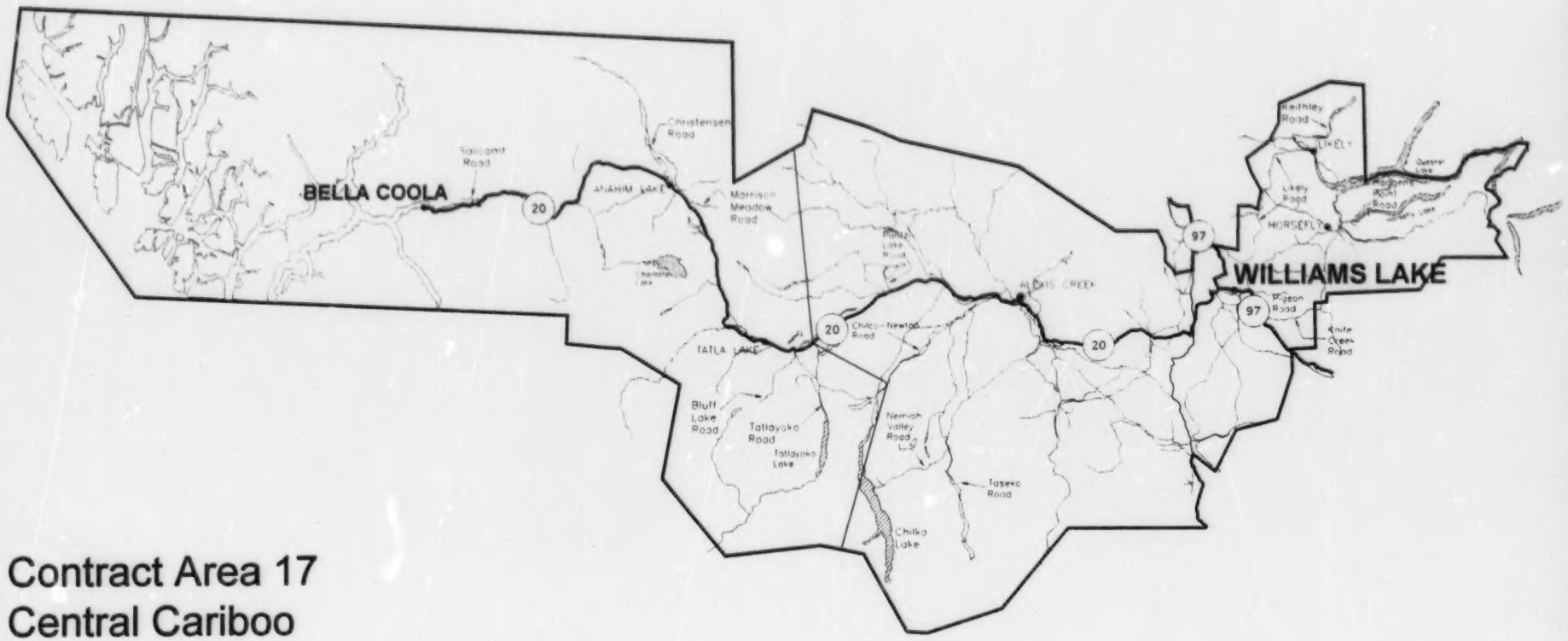
Contract Area 14
Nicola



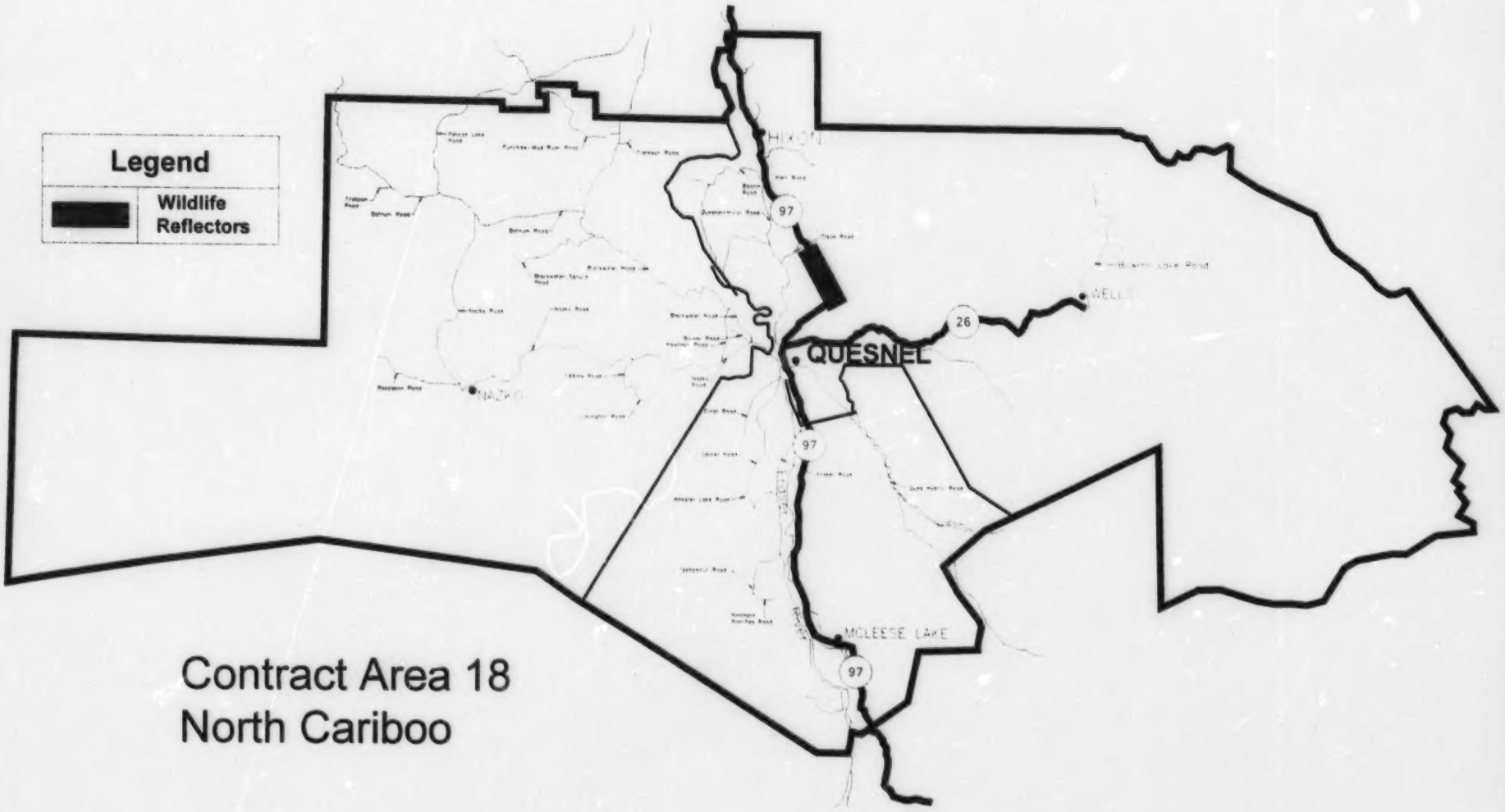

Contract Area 15
Thompson
Legend
Wildlife Exclusion Fence
CLEARWATER
BIRCH ISLAND
BRIDGE LAKE
LITTLE FORT
Barriere North Road
BARRIERE
Westsyde Road
Deadman Vidette Road
Tranquille Creek Road
CHASE
CAVONA
KAMLOOPS
5
24
1
5A
97

Contract Area 16
South Cariboo

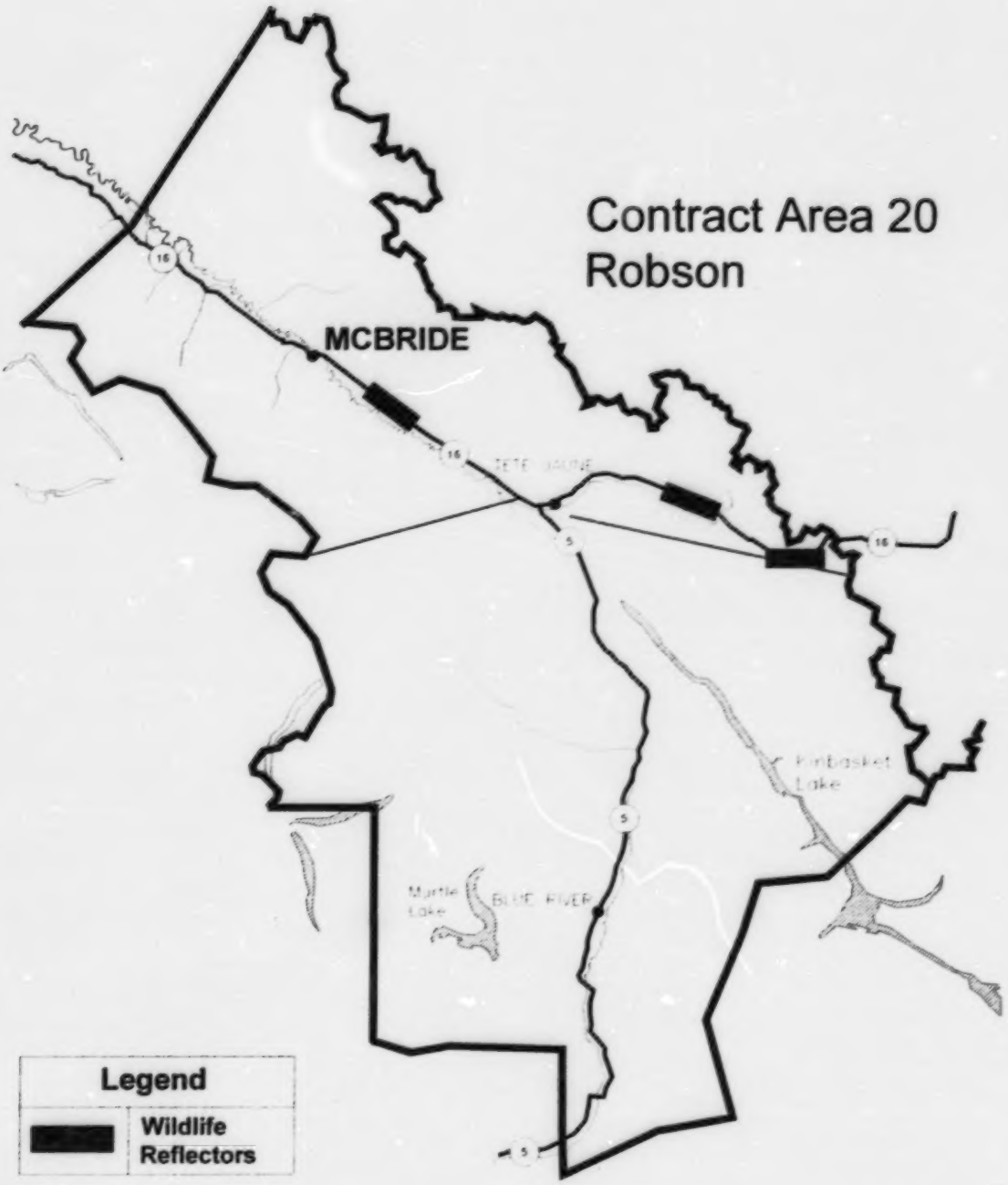


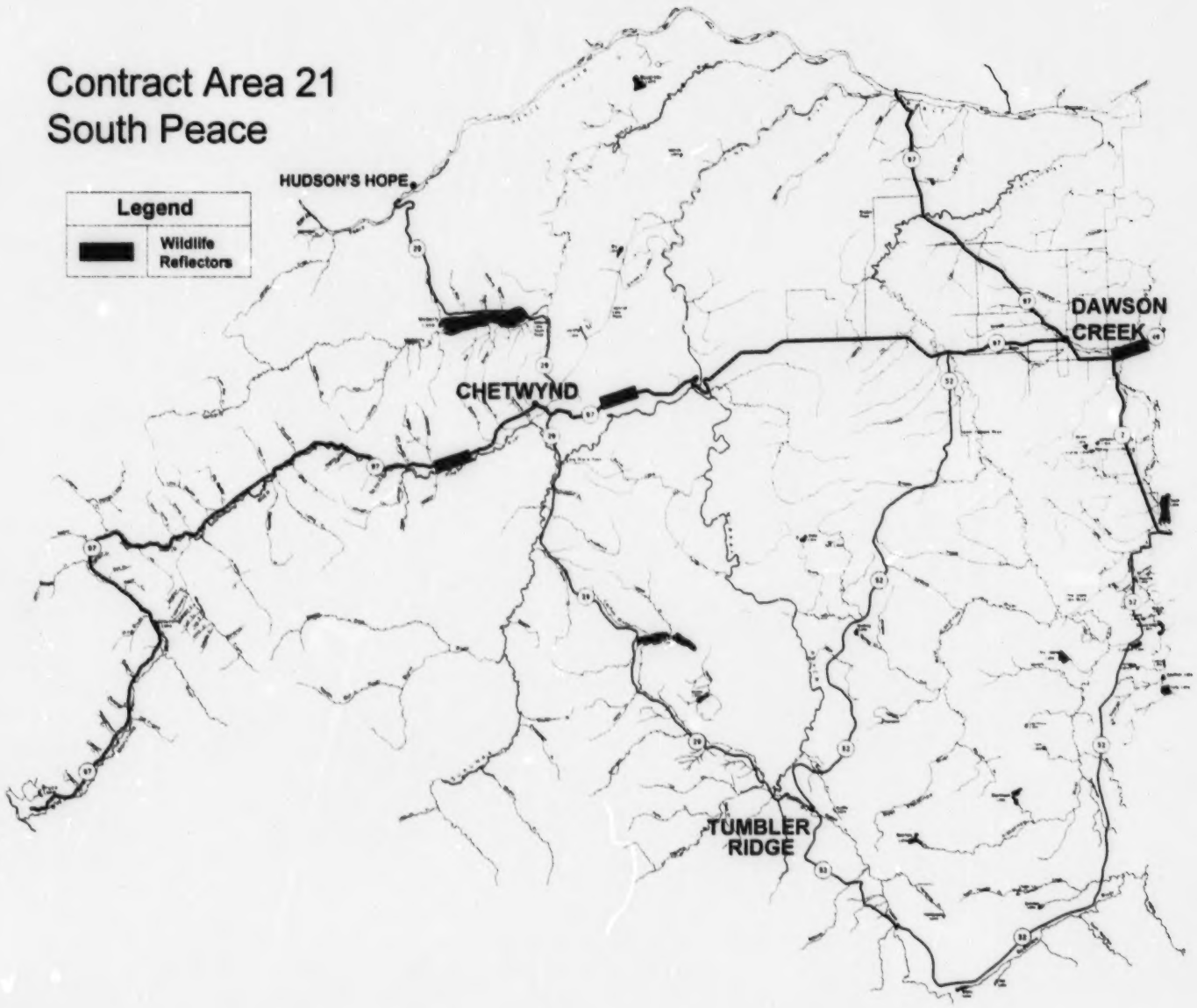


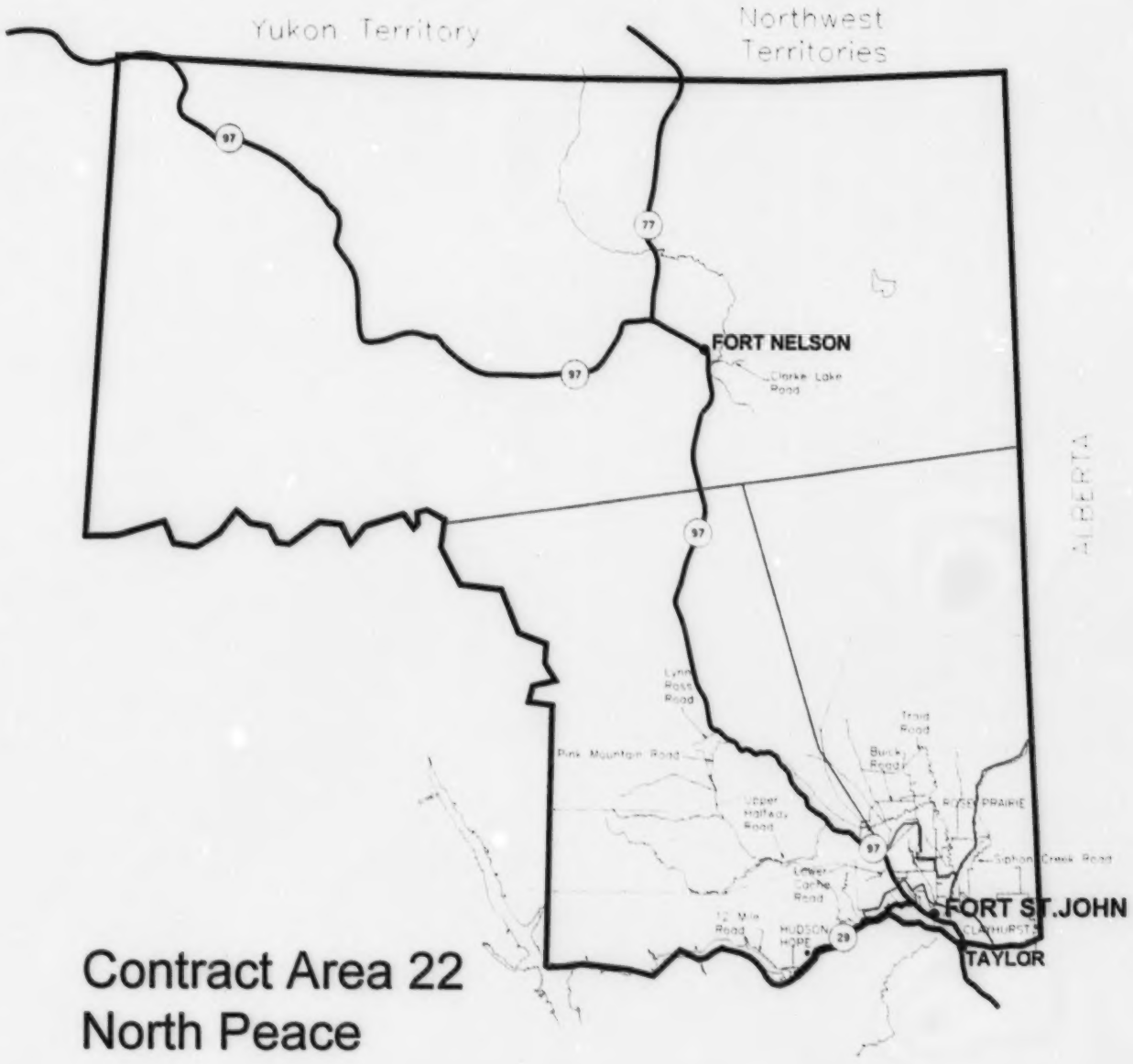
Contract Area 17
Central Cariboo


Legend
Wildlife Reflectors
HIXON
97
QUESNEL
26
97
MCLEESE LAKE
97
Contract Area 18
North Cariboo

Contract Area 19
Fort George


Contract Area 20
Robson
MCBRIDE
16
5
Purbasket
Lake
Myrtle
Lake
BLUE RIVER
Legend
Wildlife
Reflectors

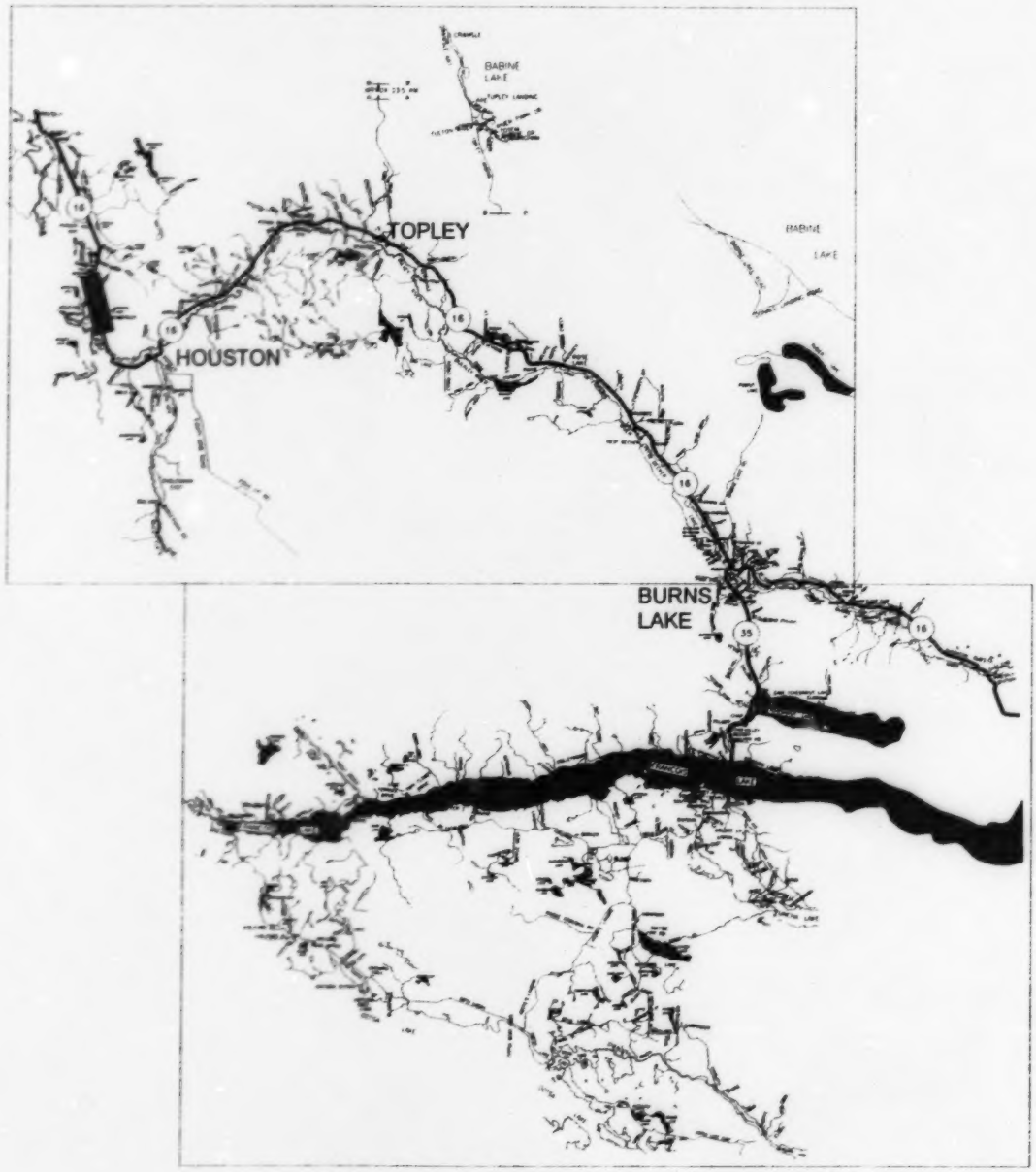

Contract Area 21
South Peace
Legend
Wildlife Reflectors
HUDSON'S HOPE
CHETWYND
DAWSON CREEK
TUMBLER RIDGE

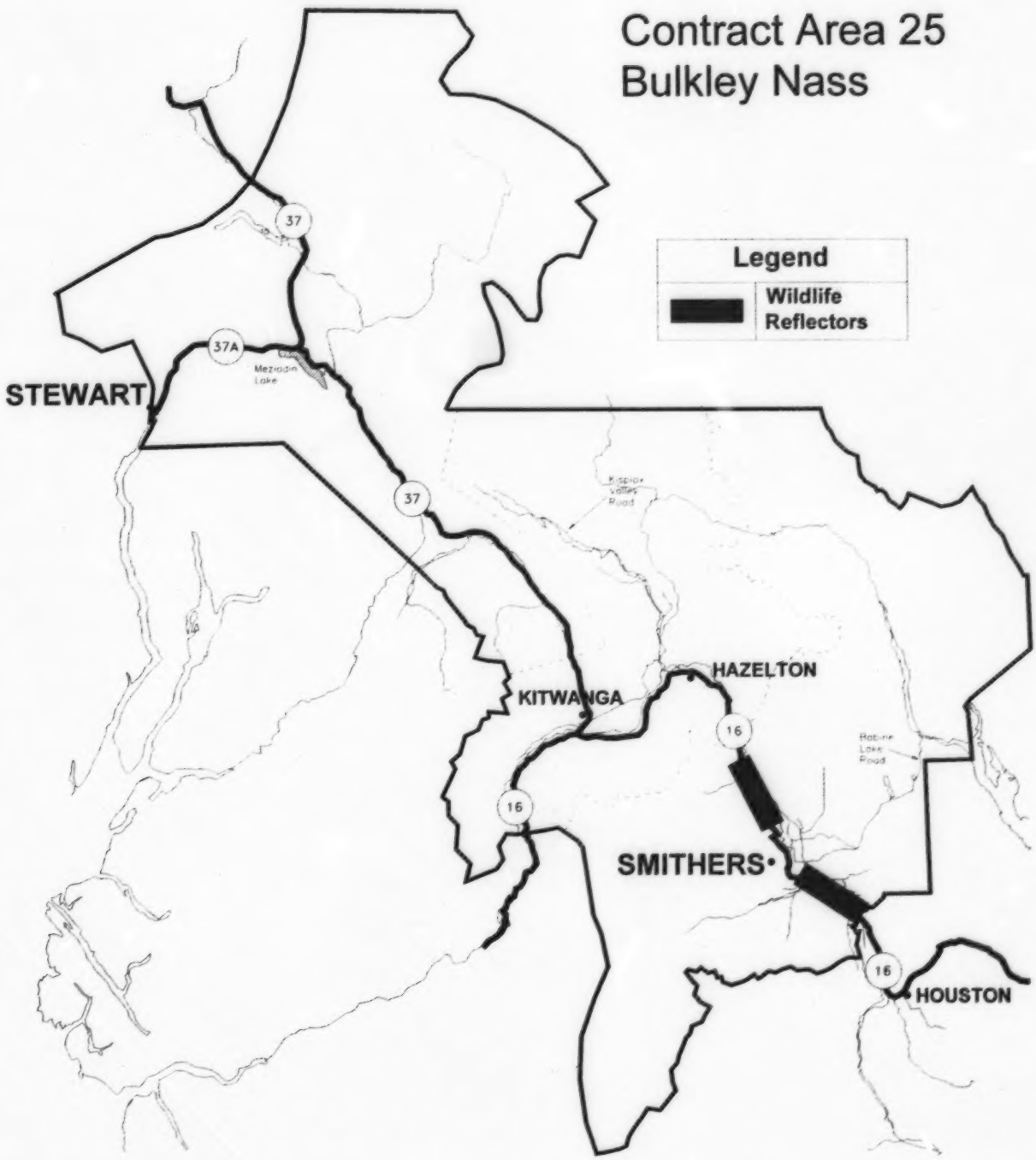


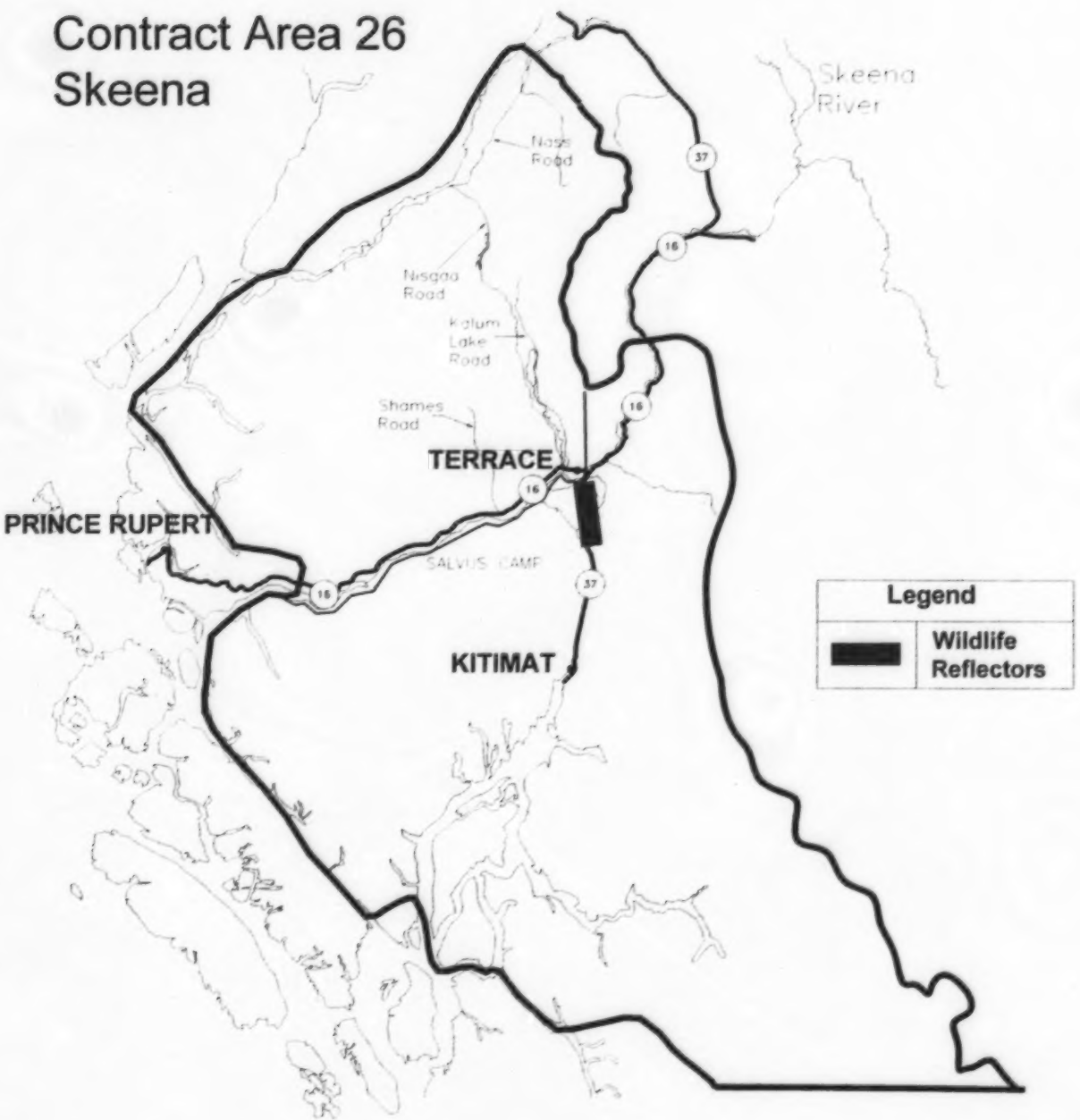
Contract Area 22
North Peace

Contract Area 23
Nechako

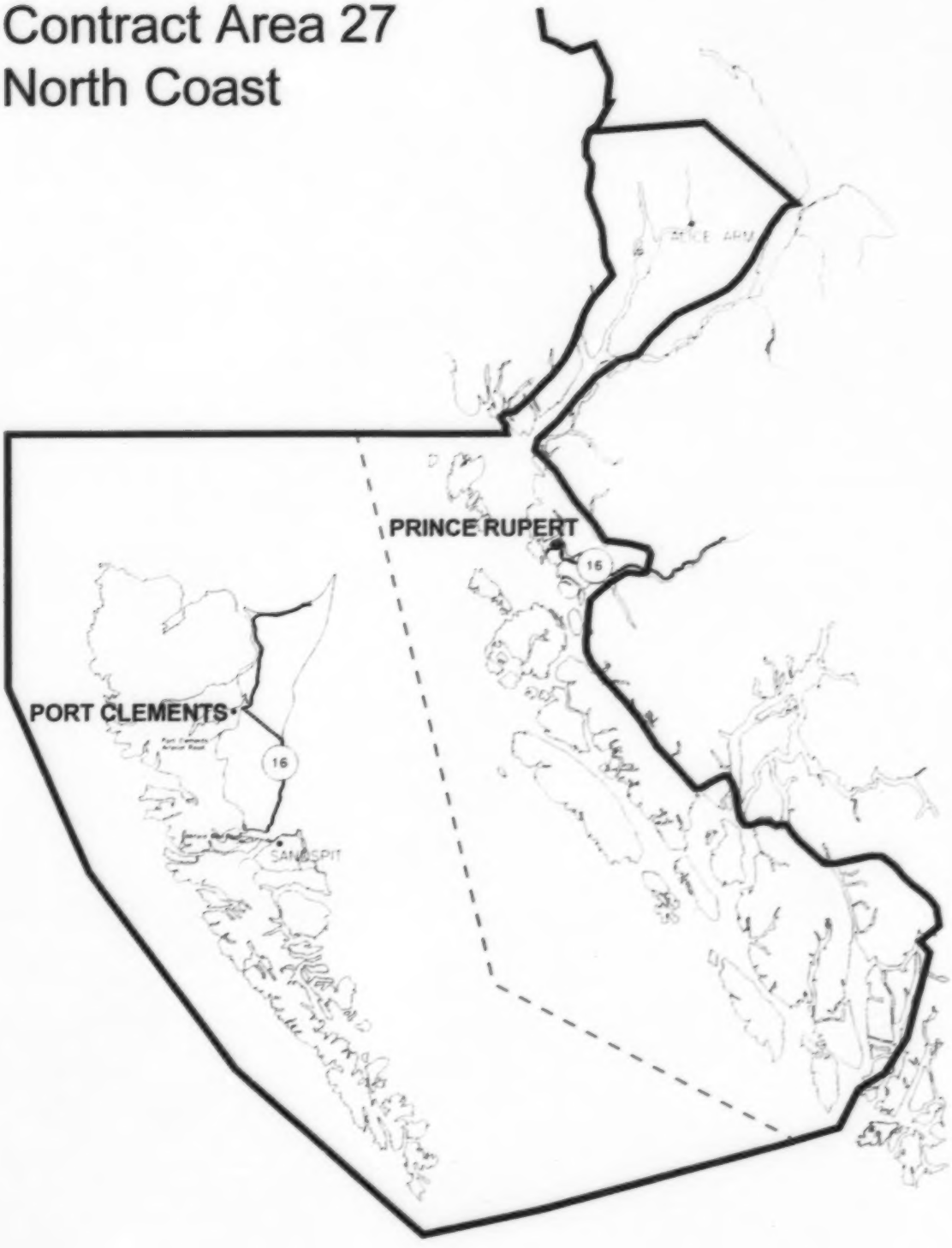
Contract Area 24
Lakes

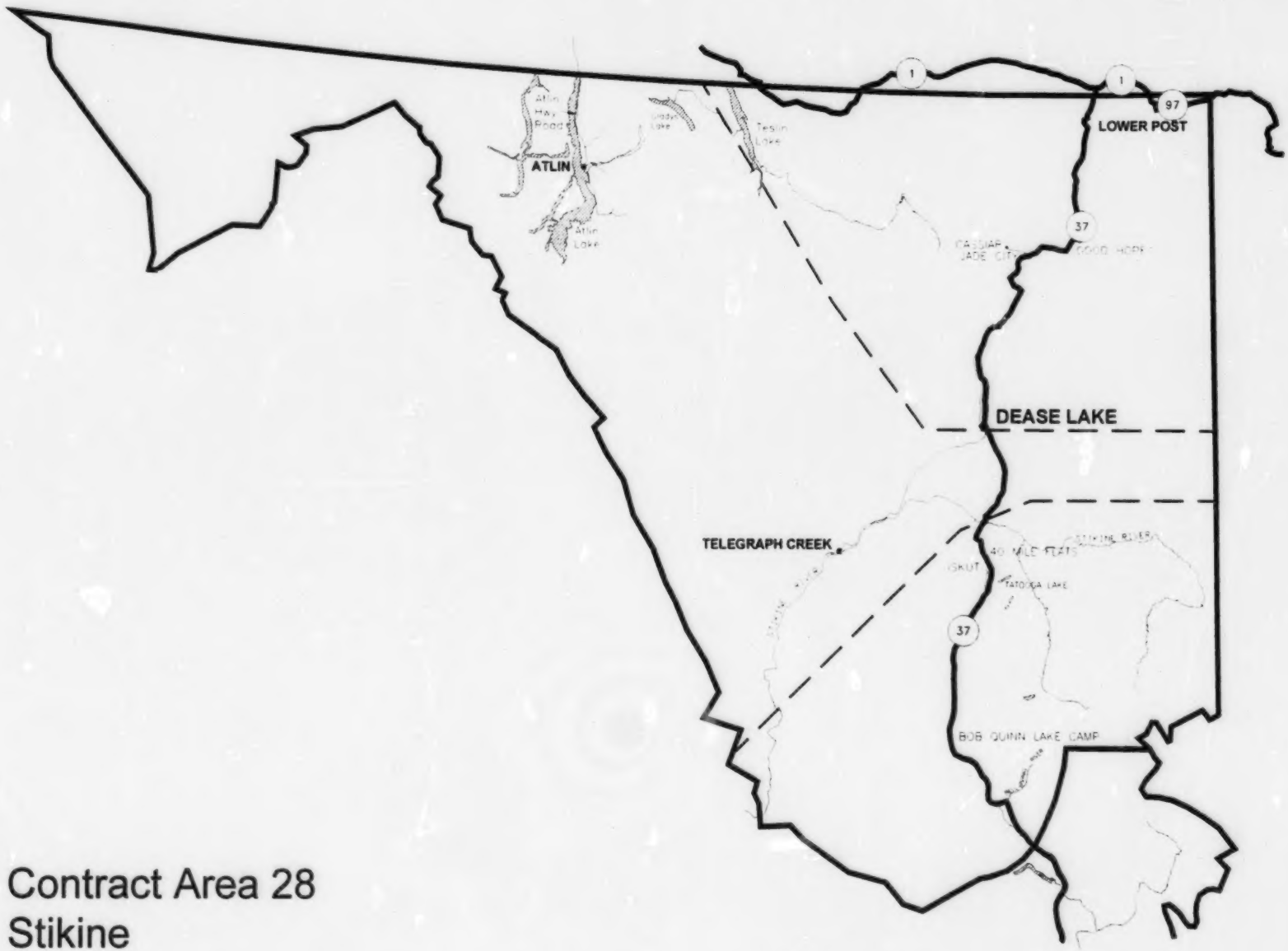



Contract Area 25
Bulkley Nass
Legend
Wildlife Reflectors
37
37A
Meziadin Lake
STEWART
37
Kisgegas Valley Road
HAZELTON
KITWANGA
16
Babine Lake Road
16
SMITHERS
16
HOUSTON


Contract Area 26
Skeena
Skeena River
Nass Road
Nisgaa Road
Kalum Lake Road
Shames Road
TERRACE
PRINCE RUPERT
SALVUS CAMP
KITIMAT
37
16
16
16
16
37
Legend
Wildlife Reflectors

Contract Area 27
North Coast





Contract Area 28
Stikine

APPENDIX C

Wildlife Warning Reflector Locations (April 2001)

Wildlife Warning Reflector Locations (April 2001)

Region	District	Highway	LKI Segment	Start km	End km	Length (km)	Side of Highway	Installation Date
1	7	3	1305	64.2	66.0	1.8	Both	1999
1	7	3	1305	88.9	90.3	1.4	Both	1999

Region	District	Highway	LKI Segment	Start km	End km	Length (km)	Side of Highway	Installation Date
2	14	5	2000	81.55	82.15	0.60	Northbound	1986/88
2	14	5	2000	85.00	85.20	0.20	Northbound	1986/88
2	14	5	2000	85.40	90.13	4.73	Northbound	1986/88
2	14	5	2000	90.26	91.85	1.59	Northbound	1986/88
2	14	5	2000	91.97	92.05	0.08	Northbound	1986/88
2	14	5	2000	92.43	93.11	0.68	Northbound	1986/88
2	14	5	2000	103.08	103.10	0.02	Northbound	1986/88
2	14	5	2000	104.30	104.42	0.12	Northbound	1986/88
2	14	5	2005	4.74	6.51	1.77	Southbound	1986/88
2	14	5	2005	16.81	19.44	2.63	Southbound	1986/88
2	14	5	2005	19.62	24.49	4.87	Southbound	1986/88
2	14	5	2005	27.38	27.68	0.30	Southbound	1986/88

Region	District	Highway	LKI Segment	Start km	End km	Length (km)	Side of Highway	Installation Date
2	15	5	1760	50.9	52.3	1.4	Both	1995/96 reinstalled to new specifications Sept 1999
2	15	5	1760	52.3	54.8	2.5	Both	Sept 1999

Region	District	Highway	LKI Segment	Start km	End km	Length (km)	Side of Highway	Installation Date
3	9	3	1325	70.5	72.5	2.00	Both	9/1/95
3	9	3	1325	121.16	123.15	1.99	Both	3/31/95
3	9	3	1325	134.59	143.96	9.37	Both	3/31/95
3	9	22	1340	10.35	11.76	1.41	Both	3/31/95
3	9	33	1327	5	9	4.00	Both	9/1/95

Region	District	Highway	LKI Segment	Start km	End km	Length (km)	Side of Highway	Installation Date
3	10	3	1375	14.32	14.92	0.60	Southbound	3/31/95
3	10	3	1375	24.26	31.71	7.45	Southbound	3/31/95
3	10	3A	1373	59.74	60.13	0.39	Southbound	3/31/95
3	10	6	1940	102.5	105.5	3.00	Both	8/1/95
3	10	6	1950	9.98	10.35	0.37	Southbound	3/31/95
3	10	23	1952	35	38	3.00	Both	9/1/95

Region	District	Highway	LKI Segment	Start km	End km	Length (km)	Side of Highway	Installation Date
3	11	3	1380	7.24	7.94	0.70	Both	1993
3	11	3	1380	7.95	9.03	1.08	Northbound	1993
3	11	3	1380	23.54	24.73	1.19	Both	1993
3	11	3	1380	38.32	42.62	4.30	Both	1995
3	11	3	1380	58.74	62.25	3.51	Both	1993
3	11	3	1385	2.78	6.41	3.63	Northbound	1989
3	11	3	1385	18.75	21.41	2.66	Northbound	1989
3	11	3	1385	49.73	52.73	3.00	Both	1993/95
3	11	3	1395	1.47	2.24	0.77	Both	1993
3	11	3	1395	2.54	3.21	0.67	Both	1993
3	11	3	1395	2.98	4.11	1.13	Both	1993
3	11	3	1395	57.26	58.34	1.08	Both	1987
3	11	3	1395	65.03	66.04	1.01	Both	1994
3	11	93	2110	2.17	2.83	0.66	Both	3/31/95
3	11	93	2110	5.02	6.16	1.14	Both	3/31/95
3	11	93	2110	17.14	17.64	0.50	Both	3/31/95
3	11	93/95	2135	26.56	29.55	2.99	Both	1993
3	11	93/95	2140	0.21	0.87	0.66	Both	1983
3	11	93/95	2140	6.27	7.44	1.17	Both	1994
3	11	93/95	2140	51.02	52.28	1.26	Both	1992
3	11	93/95	2140	52.3	53.01	0.71	Both	1992
3	11	93/95	2140	57.74	58.31	0.57	Both	1993
3	11	93/95	2140	63.01	63.82	0.81	Westbound	1994
3	11	93/95	2140	95.41	97.05	1.64	Westbound	1994
3	11	93/95	2140	97.07	97.39	0.32	Both	1994
3	11	93/95	2140	99.15	99.7	0.55	Both	1994

Region	District	Highway	LKI Segment	Start km	End km	Length (km)	Side of Highway	Installation Date
3	11	95	2160	2.95	3.32	0.37	Westbound	1992
3	11	95	2160	12.16	13.62	1.46	Both	1993
3	11	95	2160	13.65	14.1	0.45	Both	1993
3	11	95	2160	14.19	14.82	0.63	Westbound	1994
3	11	95A	2115	12.42	12.83	0.41	Both	1983/95
3	11	95A	2115	13.17	19.79	6.62	Both	1994
3	11	95A	2115	15.72	19.24	3.52	Eastbound	1993
3	11	95A	2115	21.9	24.19	2.29	Both	1992
3	11	95A	2115	24.21	24.35	0.14	Eastbound	1992

Region	District	Highway	LKI Segment	Start km	End km	Length (km)	Side of Highway	Installation Date
4	18	97	1150	18.8	21.6	2.80	Both	11/29/99

Region	District	Highway	LKI Segment	Start km	End km	Length (km)	Side of Highway	Installation Date
4	20	16	1580	103.8	104.8	1.00	Both	10/1/94
4	20	16	1590	28.39	28.99	1.60	Both	12/1/96
4	20	16	1590	29.49	31.43	1.94	Both	12/1/96
4	20	16	1590	65.28	65.98	0.70	Both	7/16/99
4	20	16	1590	66.12	66.98	0.86	Both	7/16/99

Region	District	Highway	LKI Segment	Start km	End km	Length (km)	Side of Highway	Installation Date
4	21	49	1197	3.22	4.12	0.90	Both	9/1/96
4	21	97	1160	128.320	128.750	0.43	Both	8/30/99
4	21	97	1170	32.39	33.6	1.21	Both	9/1/96

Region	District	Highway	LKI Segment	Start km	End km	Length (km)	Side of Highway	Installation Date
5	24	16	1520	103.8	104.8	1.00	Both	12/20/95
5	24	16	1520	108.18	110.5	2.32	Both	11/29/92

Region	District	Highway	LKI Segment	Start km	End km	Length (km)	Side of Highway	Installation Date
5	25	16	1520	59.340	62.810	3.470	Both	8/1/98
5	25	16	1520	74.500	76.655	2.155	Both	8/1/95
5	25	16	1520	77.410	77.845	0.435	Both	8/1/94
5	25	16	1520	78.520	79.565	1.045	Right	8/1/95
5	25	16	1520	78.535	78.695	0.160	Left	8/1/95

Region	District	Highway	LKI Segment	Start km	End km	Length (km)	Side of Highway	Installation Date
5	25	16	1520	80.018	81.029	1.011	Both	8/1/95
5	25	16	1520	84.225	85.253	1.028	Both	8/1/95
5	25	16	1520	87.584	92.392	4.808	Left	8/1/95
5	25	16	1520	88.507	92.404	3.897	Right	10/1/96
5	25	16	1520	93.277	94.020	0.743	Both	10/1/96
5	25	16	1520	97.360	97.928	0.568	Both	8/1/95
5	25	16	1520	98.010	98.165	0.155	Right	9/1/96
5	25	16	1520	99.218	100.095	0.877	Both	9/1/96

Region	District	Highway	LKI Segment	Start km	End km	Length (km)	Side of Highway	Installation Date
5	26	37	1514	44.9	47.1	2.20	Both	1997
5	26	383	N/A	0.16	1.66	1.5	Both	1995

Region	District	Highway	LKI Segment	Start km	End km	Length (km)	Side of Highway	Installation Date
6	2	19	2313	8.367	10.555	2.188	Right	1997
6	2	19	2314	5.237	7.443	2.206	Right	1997
6	2	19	2314	8.128	10.283	2.155	Right	1997
6	2	19	2314	11.234	13.419	2.185	Right	1997
6	3	19	2347	2.030	7.170	5.140	Right	09/24/99
6	3	19	2348	9.480	14.729	5.249	Right	09/24/99
6	3	19	2349	0.000	5.250	5.250	Both	03/01